Welcome Faculty, Students and Staff,

Research Day has become an annual tradition at Touro University California and it is my honor to welcome you to this festive event. We showcase today the most recent work of our faculty and students and celebrate as a university the contributions of our researchers to science, clinical practice, education and public health.

As a university heavily invested in graduate and professional education, we need to create an environment which values and nurtures intellectual curiosity and the development of new knowledge which contributes to professional practice. Your presence here today demonstrates your understanding of this worthy goal and your support for faculty and students who are presenting their research. I look forward to working with you and other members of the campus community as we build a dynamic research environment at TUC.

Sincerely,

Marilyn Hopkins, D.N.Sc.
Provost and Chief Operating Officer
Touro’s Annual Research Day provides an opportunity for students, faculty and staff to share their research efforts with the campus community. The program encourages the development of joint research projects and increases the student body awareness of the quality and range of research conducted on campus. With that being said the Research Day Organizing Committee would like to thank everyone who have participated in this year’s Research Day, without the students, faculty, and staff who have spent countless time doing their research projects, submitting their abstracts, and creating their posters to present, this event would not be possible. We are very proud to say that Research Day is continuing to grow every year.

The Research Department is grateful to this year’s major keynote speaker, Stuart A. Newman Ph.D., who is a professor of cell biology and anatomy at New York Medical College.

We would like to thank Mrs. Mallory Davis for her spotless work in the creation of this Abstract Book and for taking care of every detail that makes the program successful. We are very grateful to the following Touro University California staff for their support; Mr. Ralph Cuberos, Mr. Alex Perez, and the Facilities, Information Technology, and Food Services Departments. Lastly, we would like to acknowledge Cole-Palmer for their generous contributions to today’s event.

Organizing Committee:
Dr. Alejandro Gugliucci- Professor of Biochemistry and Associate Dean for Research
Dr. Tamira Elul- Associate Professor and Director of Interdisciplinary Research
Mrs. Mallory Davis- Administrative Assistant to the Associate Dean for Research

Alejandro Gugliucci, MD, PhD
Professor and Associate Dean for Research
Director of Campus Research and Office of Sponsored Program
KEYNOTE

SPEAKER

12:00 P.M. - 1:00 P.M.
LECTURE HALL B

11th Annual Research Day
KEYNOTE SPEAKER

Stuart A. Newman Ph.D.
Professor of Cell Biology & Anatomy
New York Medical College

Title of Presentation:
"Pattern formation of the vertebrate limb skeleton: mechanisms and models."

Stuart Newman received an A.B. from Columbia University and a Ph.D. in chemical physics from the University of Chicago. He has been a visiting professor at the Pasteur Institute, Paris, the Centre à l'Energie Atomique-Saclay, Gif-sur-Yvette, the Indian Institute of Science, Bangalore, the University of Tokyo, and was a Fogarty Senior International Fellow at Monash University, Australia. He was a founding member of the Council for Responsible Genetics, Cambridge, MA.
POSTERS BY DISCIPLINE

B-1/1  Investigations into the role of Tobacco Mosaic Virus in stimulating the innate immune system via the inflammasome
Jeff Chiu1, Alison McCormick2, and Evan Hermel1,3
1 Master of Science in Medical Health Sciences Program, College of Osteopathic Medicine, Touro University-CA
2 College of Pharmacy, Touro University-CA
3 Department of Basic Science, College of Osteopathic Medicine, Touro University-CA

B-2/2  Towards Structural Understanding of Small Molecules Targeting the HIV-1 gp41 Coiled-coil Cavity: Synthesis of Tagging Reagents, Peptide Labeling and NMR Studies.
Shidong Chu, Miriam Gochin
Department of Basic Sciences, Touro University, 1310 Club Drive, Mare Island, Vallejo, CA 94592.

B-3/3  The Role of p21 and the Senescence Program in Modulating Chemosensitivity in Human Breast Carcinoma Cells
Tobey Colston1, Athena Lin2
1 Master of Science in Medical Health Sciences Program, College of Osteopathic Medicine, Touro University California.
2 Department of Basic Science, College of Osteopathic Medicine, Touro University California.

B-4/4  Involvement of Cadherin-Catenin Complex in Growth of Arbors from Eyes to Brain in Tadpoles
Ngoc Dinh, Tamira Elul
Department of Basic Science, College of Osteopathic Medicine, Touro University, California

B-5/5  MicroRNA-762 Negatively Regulates Epithelial Expression of Innate Defenses RNase7 and ST2 in Response to Mucosal Fluid and Modulates Epithelial Susceptibility to Bacterial Invasion
D. Evans1,2, J.J. Mun2, C. Tam2, G. Chan2, J. Kim2, S. Fleiszig2,3
1 College of Pharmacy, Touro University California, Vallejo, 2 School of Optometry, 3 Graduate Groups in Microbiology and Infectious Disease, University of California, Berkeley, CA, USA.

B-6/6  Interactions of Extracellular Potassium and Extracellular Calcium with the Cardiac Potassium Channel HERG are Dependent on Channel Inactivation.
Kevin Ha, Stephen Albano, Eric Lau, Shaun Rafael, Ryan Fraiser, Alexandra Rhee, Kristeen Pareja, and Alan Miller.
Department of Basic Science, College of Osteopathic Medicine, Touro University, Vallejo, CA 94592.
The Impact of Dry Eye Disease on Barriers to *Pseudomonas aeruginosa* infection.
SR Heimer\textsuperscript{1,2}, J Mun\textsuperscript{2}, ME Stern\textsuperscript{3}, DJ Evans\textsuperscript{1,2}, and SMJ Fleiszig\textsuperscript{2}
\textsuperscript{1} Touro University California, College of Pharmacy, \textsuperscript{2} University of California-Berkeley School of Optometry \textsuperscript{3} Allergan Inc., Irvine, California.

Microneedle-mediated Delivery of Bisoprolol Hemifumarate
Kevin Ita\textsuperscript{1}, Nanik Hatsakorzian\textsuperscript{1}, Vladimir Tolstikov\textsuperscript{2}
\textsuperscript{1} College of Pharmacy, Touro University, Mare Island-Vallejo, California
\textsuperscript{2} Metabolomics Core Facility, Genome Center, University of California, Davis, California

Functional Significance of the Induction of CST1 Expression during Tumor Cell Senescence. Part-I: Over-Expression and Subcellular Localization.
Hannah Jacobs\textsuperscript{1} Athena W. Lin\textsuperscript{2} and Daniel Keppler\textsuperscript{3}
\textsuperscript{1} Master of Science in Medical Health Sciences Program, College of Osteopathic Medicine, Touro University
\textsuperscript{2} Department of Basic Science, College of Osteopathic Medicine, Touro University
\textsuperscript{3} College of Pharmacy, Touro University

Nanodiscs: A tool to Investigate the Membrane Proteins of HIV.
Hardeep Kaur, Shidong Chu and Miriam Gochin
Department of Basic Science, College of Osteopathic Medicine, Touro University California, Vallejo, CA. 94592

Oxygen-glucose Deprivation in Hippocampal Brain Slices from Transgenic Alzheimer’s Disease Mice.
Gloria J. Klapstein\textsuperscript{1}, G. Joseph Broussard\textsuperscript{2}, Rung-chi Li\textsuperscript{1}, Jennifer Mytar\textsuperscript{1}, Thuan-Thien D. Ho\textsuperscript{1}, Scott Drew\textsuperscript{1}, Slade Giles\textsuperscript{1}, Bruce Kaufman\textsuperscript{1}, Leah Phan\textsuperscript{1}, John Kinsey\textsuperscript{1}
\textsuperscript{1} Department of Basic Science, College of Osteopathic Medicine, Touro University, Vallejo, California
\textsuperscript{2} UC Davis, Davis, CA.

Human Embryonic Stem Cells Express a Unique Repertoire of Bcl-2 Family Members.
David T Madden\textsuperscript{1,2}, Jimena Davila\textsuperscript{2}, Simon Melov\textsuperscript{2}, Dale E. Bredesen\textsuperscript{23}
\textsuperscript{1} Touro University - California, College of Pharmacy, Vallejo, California
\textsuperscript{2} Buck Institute for Age Research, Novato, California
\textsuperscript{3} University of California at San Francisco, San Francisco, California

Cholinergic Neurons are Nerve Growth Factor Addicts: Can Nicotine Ameliorate Withdrawal?
Maxwell Murphy\textsuperscript{1}, Dale E. Bredesen\textsuperscript{1} and H. Michael Ellerby\textsuperscript{1,2}
\textsuperscript{1} Buck Institute for Research on Aging, Novato, CA, 94945. \textsuperscript{2} College of Pharmacy, Touro University, CA, 94592
B-14/14  Novel SHethA2 Analogs Differentially Affect Growth of Hormone Dependent Human Prostate Cancer Cells
Vanishree Rajagopalan, Rizza Alcaria, Shengquan Liu, H Michael Ellerby
Touro University-College of Pharmacy, Vallejo, CA.

B-15/15  Something From Nothing: Turning a Subunit Vaccine into a Powerful Vaccine Antigen
Sherri Wykoff-Clary and Alison McCormick Ph.D.
College of Pharmacy, Touro University, Vallejo, CA.

B-16/16  Growth Cone Central Domain (C) Length and Width has no Correlation to Xenopus Laevis Retinotectal Axonal Navigation
Manuel Zhu, Tamira Elul
Department of Basic Sciences, College of Osteopathic Medicine, Touro University California.

B-17/17  Lead Optimization of Indole Compound as HIV-1 Fusion Inhibitor Targeting gp41
Guangyan Zhou\(^a\), and Miriam Gochin\(^a\)
\(^a\)Department of Basic Sciences, Touro University-California, Vallejo, CA

B-18/18  Using NMR at 400MHz to screen for the protein aggregation state of HIV Gp41 ectodomain samples.
Joseph D. Walsh\(^{1,2}\), Miriam Gochin\(^{1,2}\)
1. Touro University Vallejo CA, 2. UCSF San Francisco Ca.
**Clinical Sciences**

C-1/19  
**Assessment of Clozapine Plasma Levels on Stable Outpatients with Schizophrenia or Schizoaffective Disorder**  
H Ameli, L Bohner, P Perry, and T Chou  
Touro University College of Pharmacy, Vallejo, CA. hamid.ameli@tu.edu

C-2/20  
**Capillary Glucose Testing After Oral Glucose Load: A Convenient Screening Test for Type 2 Diabetes and Pre-diabetes in Latino Adults**  
Peter Baginsky, MD, Mitchell Barnett PharmD  
Department of Primary Care, College of Osteopathic Medicine, Touro University California

C-3/21  
**The Ratio Paraoxonase 1 Activity in Small vs. Large HDL Subclasses and Their Apolipoprotein Composition as a Window to Functional Assessment of HDL in Atherogenesis**  
Russell Caccavello 1, Kazuhiko Kotani 2 and Alejandro Gugliucci 1  
1 Glycation, Oxidation and Disease Laboratory, College of Osteopathic Medicine, Department of Basic Sciences, Touro University-California, Vallejo, USA  
2 Department of Clinical Laboratory Medicine, Jichi Medical University, Shimotsuke-City, Tochigi, Japan.

C-4/22  
**Implementation of an Algorithm for Depression Based on the Sequenced Treatment Alternatives to Relieve Depression (STAR*D) Trial in a Ambulatory Safety-Net Clinic**  
T Chou, H Ameli, P Perry, and V Wong.  
College of Pharmacy, Touro University California, Vallejo, CA. Tony.Chou@tu.edu

C-5/23  
**Satisfaction of Patients, Student Providers, and Board of Directors Participating in the Touro University Student-run Health Clinic**  
Joy Dugan 1  
1 Touro University California, Vallejo, CA.

C-6/24  
**Acceptability of Fluzone Intradermal Vaccine to Patients and Immunizers in the United States**  
James Foy DO, Tami Hendriksz DO, Philip Malouf MD, Allison Tobin OMSII  
Department of Primary Care, College of Osteopathic Medicine, Touro University California, Vallejo, CA

C-7/25  
**CASPASE-12 Genotype Influences the Expression of Systemic Lupus Erythematosus in African-Americans**  
Trista Fuchs 1, Jennifer Kelly 2, Garland Brinkely 1, Kathy Moser 2 and Evan Hermel 3  
1. Public Health Program, College of Education and Health Sciences, Touro University-CA  
2. Arthritis and Clinical Immunology Program Oklahoma Medical Research Foundation, Oklahoma City, OK.  
3. Department of Basic Science, College of Osteopathic Medicine, Touro University-CA
C-8/26 Soluble Receptor for Advanced Glycation End Products Correlate Negatively with BMI in Patients with End-stage Renal Disease Undergoing Hemodialysis: A Mechanism for the Obesity Paradox? Alejandro Gugliucci a, Russell Caccavello a, Satoshi Kimura b, Eriko Kinugasa c and Kazuhiko Kotanid

a.Glycation, Oxidation and Disease laboratory, Department of Basic Sciences, Touro University California-COM, Mare Island, CA, 94592, USA
b. Department of Laboratory Medicine and

c. Internal Medicine Showa University Northern Yokohama Hospital, Yokohama City, 224-8503, Japan
d. Department of Clinical Laboratory Medicine, Jichi Medical University, Tochigi, Japan

C-9/27 Circulating Soluble Receptor for Advanced Glycation End Products is Inversely Correlated to Oxidized Low-density Lipoproteins in Healthy Subjects

Alejandro Gugliucci b, Kazuhiko Kotani a,b, Russell Caccavello b, Toshiyuki Yamada a, Nobuyuki Taniguchi a,

a Department of Clinical Laboratory Medicine, Jichi Medical University, Tochigi, Japan
b. Glycation, Oxidation and Disease Laboratory, Touro University-California, CA, USA

C-10/28 Circulating Soluble Receptor for Advanced Glycation End Products Increases After a Cerebrovascular Accident and May be a Marker for Encephalic Inflammation: A Follow-up Pilot Study

Teresita Menini a, Russell Caccavello a, Satoshi Kimura b, Hisato Ikeda b, Alejandro Gugliucci a

a.Glycation, Oxidation and Disease laboratory, Department of Basic Sciences, Touro University California-COM, Mare Island, CA, 94592, USA
b. Department of Laboratory Medicine and c Neurosurgery, Showa University Northern Yokohama Hospital, Yokohama City, 224-8503, Japan

C-11/29 The Effect of Meal Carbohydrate Content on de novo Lipogenesis of Chylomicrons and Very Low-density Lipoproteins

Ari Simon1, Teresa Lane1, Cherilyn Mae Acorda1, Davis Tang1, Alejandro Gugliucci1, Russell Caccavello1, Mike Wen2, and Jean-Marc Schwarz1,2

1College of Osteopathic Medicine, Touro University, Vallejo, California. 2UCSF, San Francisco, California.

C-12/30 Paraoxonase 1 and Ischemia Modified Albumin Excursions After a Cerebrovascular Accident: A Follow-up Pilot Study

Crystal Takada1,2, Russell Caccavello2, Hisato Ikeda3, Satoshi Kimura3 and Alejandro Gugliucci2

1MSMHS, College of Osteopathic Medicine, Touro University California
2 Glycation, Oxidation and Disease laboratory, Department of Basic Sciences, Touro University California-COM, Mare Island, CA, 94592, USA
3 Department of Laboratory Medicine and Neurosurgery, Showa University Northern Yokohama Hospital, Yokohama City, 224-8503, Japan
**EDUCATION & OUTCOMES**

**E-1/31**  
**Interdisciplinary Faculty Attitudes Regarding Interprofessional Education**  
CAPSLEAD Team, College of Pharmacy, Touro University of California, Vallejo, CA 94592;  
Email: David.Lash@TU.edu

**E-2/32**  
**Examination Item Evaluation and Proposed Tool to Identify Outliers for Review**  
Glenn Davis¹, Gregg Lund¹.  
¹Office of Academic Affairs, Touro University College of Osteopathic Medicine, Vallejo, CA

**E-3/33**  
**Impact of a Pharmacist-Managed Diabetes Clinic to Improve Glycemic and Cardiovascular Care**  
Eric J. Ip, Pharm.D.¹, Bijal M. Shah, B.Pharm., Ph.D.¹, Junhua Yu, Ph.D.¹, James Chan, Pharm.D., Ph.D³,  
¹Touro University, Vallejo, CA;  
³Kaiser Permanente Northern California Pharmacy Outcomes Research Group, Oakland, CA

**E-4/34**  
** Developing 2012 Biotech Academy-Touro Summer Internship for High School Students in Vallejo.**  
Christy Murphy, Ghazal Ghafari, Daniel Lim and Shin Murakami.  
Department of Basic Sciences, College of Osteopathic Medicine, Touro University, California, Vallejo, CA.

**E-5/35**  
**An Academia Advanced Pharmacy Practice Experience (APPE) and its influence on pharmacy career choice**  
Adrian Jason L. Palisoc (PharmD Candidate)¹, Julie T. Truong (PharmD)², Debra Sasaki-Hill (PharmD)³, Robert J. Ignoffo (PharmD, FASHP, FCSHP)⁴  
¹, ², ³, ⁴Touro University, Vallejo, CA.

**E-6/36**  
**Cost-effectiveness of Pharmacist Care for Diabetes: Effects on Cardiovascular Outcomes**  
Junhua Yu¹ Ph.D. MS., Bijal M Shah¹ Ph.D., Eric J Ip² Pharm.D, BCPS, CSCS, CDE, James Chan³ Pharm.D. Ph.D.  
¹Department of Social, Behavior, Administrative Science, Touro University- California College of Pharmacy. Junhua.yu@tu.edu ; T-707-638-5913; F 707-638-5959;  
²Department of Pharmacy Practice, Touro University- California College of Pharmacy;  
³Pharmacy Outcomes Research Group, Kaiser Permanente Northern California
Affect of Student Workshop on Osteopathic Medical Students Comfort Discussing Osteopathic Manipulative Treatment (OMT) Use With Attending Physicians
Angela Branda DO1, Stacey Pierce-Talsma DO, MS1, Heather Ferrill DO, MS1, Mitchell Hiserote DO2, Gregg Lund, DO, MS2,3.
1Department of Osteopathic Manipulative Medicine, University of New England College of Osteopathic Medicine, Biddeford, ME. 2Department of Osteopathic Manipulative Medicine and 3Office of Academic Affairs, Touro University College of Osteopathic Medicine, Vallejo, CA

Unfurling the Flag Abroad: A Demonstration of Osteopathic Principles and Practices for Obstetric Patients in Ethiopia
Christopher Kargel1, Anita Showalter2, Janet Burns3, Abinet Sisay4

Somatic Dysfunction Severity Observed at Various Global Health Sites Using a Modified Stiles Screening Exam
Thomas Liggett1,#, OMS II; Jeffrey Brodovsky1, OMS II; Mickey Lui1, OMS II; Susie Mao1, OMS II; Jessica Marshall1, OMS II; Eiman Mahmoud1,2,#, MD, MPH; Janet M. Burns1,#, DO
Touro University- California; 1310 Club Drive; Vallejo, CA 94592
1College of Osteopathic Medicine, 2Director of Public Health Program, #Principal Investigators

Comparison of OMM and TCM Tui-Na Diagnostic Methodology
Mickey Lui, OMS II1, Yen-Chih Lin, OMS II1, Bor-Han Chiu, OMS II1, Karen Koto, OMS II: Yen-Yi Ho, CMD3, Athena Lin, PhD1, Janet Burns, DO2
1Global Health Program, Touro University-CA College of Osteopathic Medicine, Vallejo, CA, 2Department of Osteopathic Manipulative Medicine, Touro University-CA College of Osteopathic Medicine, Vallejo, CA, USA 3Taipei Hospital, Department of Health, Hsin-Chuang District, New Taipei City, 242-13, Taiwan (R.O.C.)

Treatment of somatic dysfunction through the use of fascial continuity in TCM Tui-Na: Comparisons to OMM
Mickey Lui, OMS II1, Yen-Chih Lin, OMS II1, Bor-Han Chiu, OMS II1, Karen Koto, OMS II: Yen-Yi Ho, CMD2, Athena Lin, PhD1,4, Janet Burns, DO1,3
1.Touro University-CA College of Osteopathic Medicine, Vallejo, CA, USA, 2.Taipei Hospital, Department of Health, Hsin-Chuang District, New Taipei City, 242-13, Taiwan (R.O.C.), 3. Department of Osteopathic Manipulative Medicine, 4. Global Health Program
Comparison of Osteopathic Manipulative Medicine and Exercise on Blood Lactate Clearance

Javier Mendez\textsuperscript{1}, Ted S. Wong, Ph.D\textsuperscript{2}, Mitchell Hiserote, DO\textsuperscript{3}

\textsuperscript{1}Master of Science in Medical Health Sciences Program, College of Osteopathic Medicine, Touro University California.

\textsuperscript{2}Department of Basic Science, College of Osteopathic Medicine, Touro University California.

\textsuperscript{3}Department of Osteopathic Manipulative Medicine, College of Osteopathic Medicine, Touro University California.
PUBLIC HEALTH

P-1/45  Community-based Oral Health Promotion in North Vallejo: Exploration of Service Providers’ Perspectives
Lan N. Doan¹, Annette Aalborg¹, Maria-Alexandra Moraitis¹, Gayle Cummings¹
¹College of Education and Health Sciences, Touro University California, Vallejo, CA

P-2/46  The Power of Marketing: Snus tobacco as a Swedish Heritage Product
Jennifer Gerwick¹, Elena O. Lingas¹, ²
¹College of Education and Health Sciences, Touro University California, Vallejo, CA
²School of Pharmacy, University of California San Francisco, San Francisco, CA

P-3/47  Exposure to DEHP and its Implications in the Pediatric Population of Taiwan
Karen Koto¹, Sandy Liao¹, Yen-Chih Lin¹, Mickey Lui¹, Bor-Han Chiu¹, Athena Lin PhD¹, I-Jen Wang MD/PhD²
¹Global Health Program, Touro University College of Osteopathic Medicine, Vallejo, California
²Taipei Hospital Department of Pediatrics, Department of Health, Hsin-Chuang District, New Taipei City, Taiwan (R.O.C.)

P-4/48  Food Stamps and Increased Obesity in the Current Economy
Le’Anna S. St.John¹, Garland L. Brinkley²
¹MSPAS/MPH Program, College of Education and Health Sciences, Touro University California
²Public Health Program, College of Education and Health Sciences, Touro University California
Investigations into the role of Tobacco Mosaic Virus in stimulating the innate immune system via the inflammasome

Jeff Chiu¹, Alison McCormick², and Evan Hermel¹,³

¹. Master of Science in Medical Health Sciences Program, College of Osteopathic Medicine, Touro University-CA
². College of Pharmacy, Touro University-CA
³. Department of Basic Science, College of Osteopathic Medicine, Touro University-CA

Background: Cancer vaccines are designed to stimulate the immune system to eradicate cancer cells. One strategy for such a vaccine is to utilize a vector fused with a specific tumor-derived antigen that would stimulate CD8+ cytotoxic T lymphocytes to recognize and destroy tumor cells. This strategy mimics the use of virus-like particle vaccines, such as those used for the prevention of cervical cancer. Tobacco mosaic virus, a plant virus, has been identified as a potential carrier that is safer for tumor epitopes, and induces cell-mediated immunity in murine tumor models. In this study, we explore the mechanism of this response, particularly by looking at the involvement of the inflammasome, a multi-protein complex that plays a significant role in the pathway regulating IL-1β secretion, a critical pro-inflammatory cytokine.

Hypothesis: Tobacco mosaic virus is immunostimulatory by activating the inflammasome.

Methods: THP-1 (macrophage) and Jiyoye (Burkitt's lymphoma) cells were incubated overnight with culture medium only, lipopolysaccharide and ATP, and varying amounts of tobacco mosaic virus (TMV) or TMV capsid antigen. Cells were lysed and proteins were separated via polyacrylamide gel electrophoresis. Proteins were then transferred to solid support and probed with anti-caspase-1 (CASP1) and interleukin-1β (IL1β) antibodies to assess activation and processing of CASP1 and IL1β.

Results and Conclusions: Experiments are ongoing to optimize our experimental system, and results will be presented.
Towards Structural Understanding of Small Molecules Targeting the HIV-1 gp41 Coiled-coil Cavity: Synthesis of Tagging Reagents, Peptide Labeling and NMR Studies.
Shidong Chu, Miriam Gochin
Department of Basic Sciences, Touro University, 1310 Club Drive, Mare Island, Vallejo, CA 94592.

Background: In 2010, 34 million people are living with HIV/AIDS and 1.8 million people died of AIDS-related diseases, according to the 2011 epidemic update from WHO-UNAIDS. Despite significant progress being made in the past 30 years, the virus spread has not halted and a definitive cure remains elusive. There is clearly a need for exploring new therapeutic options.

Entry of HIV-1 into the host cells is mediated by its two envelope glycoproteins: gp 120 and gp41: Upon gp120 binding to cellular receptors, gp41 undergoes a series of conformational changes from a non-fusogenic to a fusion-active conformation and mediates the fusion of the viral and host membranes. The fusogenic core of gp41 is a trimer of helical hairpins in which three C-terminal helices pack against a central coiled coil formed by three N-terminal helices. The formation of this fusogenic structure brings the viral and cellular membranes close together, a necessary condition for membrane fusion to occur.

Well-crafted molecules that bind to the hydrophobic cavity on the surface of the coiled coil of gp41 may prevent the formation of fusogenic structure, thus inhibit the membrane fusion and HIV-1 entry. One of our goals is to get more structural understanding of the small molecule that is interacting with the coiled coil of gp41, thus to assist the development of new inhibitors of HIV-1 fusion.

Methods: The tagging reagents were synthesized chemically, purified by silica gel chromatography or high-pressure liquid chromatography (HPLC), confirmed by liquid chromatography-mass spectroscopy (LC-MS), and nuclear magnetic resonance (NMR) spectroscopy.

Results: Two nitrilotriacetic acid (NTA)-based tags, namely Nα-mono (carbonylmethyl)-L-cysteine and Nα, Nα-bis(carbonylmethyl)-L-cysteine, were synthesized from S-trityl-L-cysteine through 3-step chemical reactions. The synthesized NTA tags are being conjugated to the peptides.

Future Directions: The peptide-NTA conjugates will be used in NMR spectroscopy studies. Long-range distance restraints obtained from NMR studies will be used in defining the detailed binding structures of the small molecules to the gp41 coiled coil pocket.
The Role of p21 and the Senescence Program in Modulating Chemosensitivity in Human Breast Carcinoma Cells
Tobey Colston¹, Athena Lin²

¹. Master of Science in Medical Health Sciences Program, College of Osteopathic Medicine, Touro University California.
². Department of Basic Science, College of Osteopathic Medicine, Touro University California.

Background: Current cancer treatments utilize highly toxic chemotherapeutic drugs that trigger apoptosis in cancer cells, but also affect proliferative healthy cells in the body. As a result, cancer patients suffer from side effects that range from physical changes to debilitation. While apoptosis represents an effective mean to eliminate cancer cells, some cancer cells undergo permanent growth arrest in response to treatment with chemotherapeutic agents. Recent studies show that cellular senescence, a permanent and characteristic cell cycle arrest, can be triggered in breast cancer cells through the activation of the Ras/MEK signaling pathway. Moreover, inactivation of the CDK inhibitor, p21, renders cancer cells refractory to this oncogene-induced tumor senescence. These findings together suggest that senescence involving p21 is a cellular response that can be triggered in cancer cells.

Hypothesis: p21 may play a role in tumor senescence in response to chemotherapeutic agents in breast cancer cells. Inactivating the senescence pathway mediated by p21 may force tumor cells into apoptosis in response to cancer chemotherapeutic agents, and thus increase chemosensitivity and allow for the administration of lower doses of chemotherapy drugs.

Methods: Retroviral gene transfer was utilized to introduce shRNA into the MCF-7 and MDA-MB231 human breast carcinoma cell lines in order to knockdown p21 expression. Knockdown efficiency was determined with gel electrophoresis and western blotting. Chemosensitivity assays were performed using etoposide and taxol to examine tumor response and explore the underlying mechanism.

Results: Western blot analysis confirmed the successful knockdown of p21 in breast carcinomas cells. The relevance of p21 in chemosensitivity in these cells will be discussed.

Conclusion: This study may lead to the identification of a novel mechanism that will help increase chemosensitivity in human breast cancer cells.
Involvement of Cadherin-Catenin Complex in Growth of Arbors from Eyes to Brain in Tadpoles
Ngoc Dinh, Tamira Elul
Department of Basic Science, College of Osteopathic Medicine, Touro University, California

Background: Catenins are proteins that are found adjacent to the plasma membrane, in the cytoplasm and nucleus of the cell. They often exist in complexes with Cadherins, which are a class of transmembrane glycoproteins. These Cadherin-Catenin complexes play a crucial role in cell-cell adhesion and maintenance of tissue framework. Disruption of Cadherin-Catenin complexes has been demonstrated extensively in the literature to affect normal cell growth and differentiation.

Hypothesis: Disruption of the interaction between beta- and alpha-catenin in the Cadherin complex may lead to changes in cytoskeleton of optic axons, thus changes in rate of growth of arbors from eyes to brain of tadpoles.

Methods: DNA encoding for GFP or for a GFP tagged mutant that disrupts beta-catenin-alpha-catenin interactions was injected into eyes of tadpoles. The expression of GFP by the optic axons allowed observation of pattern of growth of these axons. These arbors were time-lapsed imaged at 0 hour and 1 hour using confocal microscopy. Length and number of branches of each individual arbors were measured at the 2 time points. The growth of wild type and mutant branches were compared to each other by calculating average rate of extension and retraction in each group.

Results: At 0 hour, the wild type arbor had 13 branches with a total length including the axis of 169 µm, and at 1 hour there were 15 branches with total length of 187 µm. It was observed that 8 branches elongated, 3 retracted, 1 was eliminated, 1 remained unchanged, and 2 new branches formed. For the branches, the average rate of extension was 54%, and average rate of retraction was 41%.
At 0 hour, the mutant arbor had 16 branches with a total length of 192 µm, and at 1 hour the mutant had 16 branches with a total length of 191 µm. It was observed that 8 branches elongated, 5 retracted, 1 was eliminated, and 2 remained unchanged. No new branch formed. For the branches, the average rate of extension was 30% and average rate of retraction was 41%.

Conclusions: The mutant arbor started out with more branches and larger total length than the wild type group. However, during the 1 hour interval, the wild type arbor showed net extension whereas the mutant arbor did not extend. This suggests that the beta-catenin-alpha-catenin complex both positively and negatively regulates extension of branches in optic axon arbors. Thus the Cadherin-catenin complex provides guidance of optic axon toward its final destination and modifies the pattern of growth along the way.
MicroRNA-762 Negatively Regulates Epithelial Expression of Innate Defenses RNase7 and ST2 in Response to Mucosal Fluid and Modulates Epithelial Susceptibility to Bacterial Invasion

D. Evans1,2, J.J. Mun2, C. Tam2, G. Chan2, J. Kim2, S. Fleiszig2,3
1. College of Pharmacy, Touro University California, Vallejo, 2. School of Optometry, 3. Graduate Groups in Microbiology and Infectious Disease, University of California, Berkeley, CA, USA.

Background: Mucosal surfaces regulate defenses against infection and excessive inflammation. We previously showed that human tears up-regulated the epithelial expression of genes encoding RNase7 and ST2, which inhibited bacterial invasion of corneal epithelial cells. Here we analyzed microRNA (miR) expression in human corneal epithelial cells after exposure to tear fluid and bacterial antigens, and hypothesized that an up-regulated microRNA would modulate expression of RNase7 and ST2 and bacterial invasion.

Methods: Microarray analysis was used to determine miR expression in cultured human corneal epithelial cells in response to human tear fluid and Pseudomonas aeruginosa antigens. RT-PCR was used to confirm miR up- or down-regulation. RNA was extracted using the RNeasy Kit (Qiagen, Valencia, CA) with Qiashredder columns used for cell lysis and inserting Qiagen on-column DNase steps to remove contaminating genomic DNA. Epithelial cells were transfected with scrambled control antagomir/mimic (100 nmol/L) or miR-762 antagomir/mimic using Lipofectamine RNAi Max (Invitrogen, Carlsbad, CA) for 6 h. Cells were used for assays at 48 h after transfection. Bacterial invasion was measured using gentamicin survival assays.

Results: Tear exposure up-regulated miR-762 and miR-1207, and down-regulated miR-92 and let-7b (all > 2-fold). RT-PCR confirmed miR-762 up-regulation > 3-fold in tear-antigen exposed cells. Without tears or antigens, an antagomir reduced miR-762 expression relative to scrambled controls by ~50%, and increased expression of RNase7 (~80 %), ST2 (~58%) and Rab5a (a predicted target, ~75%), but did not affect P. aeruginosa internalization. Conversely, a miR-762 mimic reduced Rab5a, RNase7 and ST2 expression, and increased P. aeruginosa invasion > 3-fold. With tear exposure, the antagomir reduced miR-762 induction, and increased RNase7 and ST2 expression.

Conclusion: These data show that mucosal fluids modulate microRNA expression to regulate innate defense, and that miR-762 negatively regulates RNase7, ST2 and Rab5a. Tear-induction of miR-762 may counter over-expression of specific innate defense factors. Since RNase7 and ST2 inhibit bacterial internalization, and are up-regulated by tears, other tear-induced factors must antagonize miR-762 inhibition to regulate epithelial resistance to bacteria.

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Interactions of Extracellular Potassium and Extracellular Calcium with the Cardiac Potassium Channel HERG are Dependent on Channel Inactivation.
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Background: The human ether a-go-go related gene (HERG) encodes a cardiac potassium channel that is important in the repolarization of the action potential. A reduction in the number of HERG channels has been implicated in long QT syndrome, which in some cases can degenerate into the lethal arrhythmia Torsades de Pointes. Many patients present with abnormal serum electrolyte levels due to a variety of conditions including gastrointestinal dysfunction, renal and endocrine disorders, diuretic use, alcoholism, and also with aging. Extracellular electrolytes have also been shown to alter HERG function and to be associated with long QT syndrome. We have previously shown that reduction of HERG by extracellular Ca$^{2+}$ is dependent on extracellular potassium, suggesting an interaction between calcium and potassium at the extracellular mouth of the HERG channel.

Hypothesis: HERG inactivation involves either the selectivity filter or the outer mouth of the HERG channel (or both). Since previous experiments suggest that Ca$^{2+}$ may interact at the outer mouth of the HERG channel to reduce HERG current, HERG inactivation may play a role in HERG current reduction by extracellular calcium. The hypothesis of this project is that altering HERG inactivation will alter the ability of calcium to decrease HERG current.

Methods: Experiments were performed using two-electrode voltage clamping of Xenopus oocytes expressing either wild-type HERG or the inactivation deficient mutant S631A. cRNA was injected into enzymatically defolliculated oocytes and currents recorded 1-5 days after injection.

Results: Increasing extracellular calcium from 0.1 mM to 10 mM resulted in a greater decrease in WT HERG current when extracellular potassium was reduced from 20 mM to 0 mM. However, increasing extracellular calcium from 0.1 mM to 10 mM resulted in approximately the same amount reduction in S631A in either 20 mM or 0 mM extracellular potassium.

Conclusions: Although the mechanism by which extracellular calcium reduces current through HERG channels is not clear, one plausible explanation is pore block. The results presented here are in agreement with our previous results suggesting an interaction between extracellular calcium and the outer mouth of the HERG channel. In addition, the data suggest that inactivation may play a role in the reduction of HERG by extracellular calcium. We propose a model, consistent with our data, which suggests that there are two extracellular calcium binding sites and that one of these is dependent on extracellular potassium. This study has implications for an increased risk of cardiac arrhythmias in patients with hypokalemia.
The Impact of Dry Eye Disease on Barriers to *Pseudomonas aeruginosa* infection.
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**Background:** Millions of Americans suffer from a condition commonly known as dry eye (DE), or keratoconjunctivitis sicca, which is characterized by low tear volumes and inflammation of the ocular surface. Epidemiological data and specific changes in the tear film composition suggest that DE patients are compromised in their defenses against microbial colonization. Consequently, DE is commonly cited as a risk factor for corneal infections. Relatively little is known about the pathophysiological processes involved. Our work with a common ocular pathogen, *P. aeruginosa*, has shown that tears can protect the eye from infection by influencing both bacterial factors and corneal defenses.

**Hypothesis:** Dry eye disease will negatively impact ocular clearance of *P. aeruginosa* and increase susceptibility to corneal infections.

**Methods:** Dry eye was induced in female C57BL/6 mice (6-8wk) with subcutaneous injections of scopolamine (500 μg three times daily) and continuous exposure to air drafts of low humidity (< 40%). Control animals received PBS injections and were housed under standard vivarium conditions. Following 5d and 10d of treatment, tear production was measured with cotton threads, and corneal epithelium integrity assessed with fluorescein staining. Mice were topically inoculated under sedation with 10⁹ colony forming units (CFU) of *P. aeruginosa* and assessed 6 h post-inoculation (pi) for residual bacterial CFUs in the tear fluid and on the cornea. In some cases, corneal health was monitored for 4 d pi. Ocular surface washes were also analyzed by immunoblotting for the relative abundance of known tear proteins.

**Results:** In DE mice, tear volumes were significantly reduced after 5 d of treatment (25% of controls, p = 0.01, Mann-Whitney), and by 10 d punctate fluorescein staining of the cornea was detectable. Surprisingly, significantly fewer bacteria were culturable from the tears of DE mice (< 2% of controls, p < 0.05, Mann-Whitney). Likewise, fewer bacteria adhered to DE corneas than controls; albeit the differences were not statistical significant. Less than 15 % of challenged mice displayed corneal pathology with no significant difference between the incidence rates of the DE (13.6%) and control groups (14.2%) [p value > 0.1 (Fisher Exact Test)]. Disease severity in the DE mice appeared to be comparable, or slightly less in some cases. Interestingly, more surfactant protein D (SP-D) was observed in the ocular washes of DE mice than controls. Transgenic mice lacking SP-D retained more bacteria on their corneas under DE conditions than non-DE (10-fold, p < 0.05, Mann-Whitney).

**Conclusion:** Decreased tear volumes and changes in corneal integrity (associated with fluorescein staining) do not correlate with poor *P. aeruginosa* clearance from the ocular surface or increased susceptibility to infection. Increased levels of a surfactant protein were observed in DE tears that may aid in bacterial aggregation and clearance. It is not clear whether this protective change in DE tears is able to mask an underlying susceptibility of corneal tissue, damaged by DE inflammation.
Microneedle-mediated Delivery of Bisoprolol Hemifumarate
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Background: Bisoprolol is a β-blocking agent used in the management of hypertension. The drug is hydrophilic with log P value of -0.05. Due to low partition coefficient, passive penetration of bisoprolol across the skin is low. Facilitated transdermal delivery of this drug would be beneficial for hypertensive patients. The aim of this project was to study the influence of microneedles on transdermal delivery of bisoprolol hemifumarate across porcine ear skin in vitro.

Methods: An LC-MS/MS technique was developed for quantitative determination of bisoprolol hemifumarate. Liquid chromatography-tandem mass spectrometry was performed with Waters Acquity UPLC system (Waters Corp., Milford, MA, USA) interfaced to an Applied Biosystems Scien 4000-QTRAP mass spectrometer (Applied Biosystems, Foster City, CA, USA). MRM transition was predetermined for bisoprolol: Q1 326.00 (parent ion [M+H]+) and Q3 116.00 (daughter ion [M+H]+). The lower limit of quantitation was 1ng/ml. Using the LC/MS/MS technique, we carried out skin permeation studies to quantify the influence of microneedles on transdermal delivery of a hydrophilic permeant – bisoprolol hemifumarate. Pig ear skin was used since it is a representative model of human epidermal membrane.

Results: Trascutaneous flux of bisoprolol hemifumarate, determined using the developed LC-MS/MS technique, was 1.17µg/cm²/hr. Flux values for bisoprolol following the use of silicon and stainless steel microneedles were 2.79– and 2.31 µg/cm²/hr respectively. Twelve passes of a gold-titanium microneedle skin roller resulted in a trasdermal flux of 3.44 µg /cm²/hr.

Conclusions: Microneedles significantly enhanced the percutaneous penetration of bisoprolol hemifumarate. It may be feasible to develop transdermal microneedle patches for bisoprolol hemifumarate.
Functional Significance of the Induction of CST1 Expression during Tumor Cell Senescence. Part-I: Over-Expression and Subcellular Localization.

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Background: Cellular senescence plays an important role as a protective mechanism against tumor formation and progression. Cellular senescence is a form of irreversible cell-cycle arrest. There are multiple ways to trigger cellular senescence: activation of an oncogene (RasV12), prolonged cell divisions (DNA replication), prolonged serum deprivation and exposure to radiations. In all four of these models of cellular senescence, expression from the CST1 gene was strongly induced. Cst-1 is a potent endogenous inhibitor of lysosomal cysteine proteases. It is found mainly in human secretions such as saliva and tears. Protease inhibitors play a role in various physiological and pathophysiological processes such as cell signaling, survival, proliferation, migration and differentiation. The goal of this study was to further characterize the biological function and localization of Cst-1/cystatin SN (the product of the CST1 gene) in normal and tumoral cells.

Hypothesis: Induction of CST1 expression occurs during senescence of tumor cells. The Cst-1 protein accumulates intracellularly within lysosomes, where it inhibits target proteases such as cathepsin B or cathepsin S.

Methods: Stable retroviral transduction of human tumor cells and normal human fibroblasts with oncogenic RasV12, activated MEK69 and wild-type CST1 cDNAs; preparation of cell lysates and analysis of cellular proteins by SDS-PAGE followed by western blotting using specific Cst-1 antibodies; and immunofluorescence cytochemical labeling of cells using antibodies specific for Cst-1, cathepsin B or cathepsin S.

Results: 1) Tumor cells harboring endogenous Ras mutations are refractory to oncogenic RasV12- but not to activated MEK69-induced senescence. Interestingly, CST1 expression was induced only after transduction with activated MEK69 suggesting that induction of this cystatin is tightly linked to the irreversible cell-cycle arrest and phenotypic changes characteristic of cellular senescence. 2) Human IMR90 lung fibroblasts and MDA-MB-231 breast carcinoma cells were successfully transduced with the CST1 cDNA and shown by western blotting and immunofluorescence cytochemistry to over-produce Cst-1/cystatin SN. Sub-cellular localization of Cst-1 appeared vesicular suggesting perhaps intracellular accumulation within endosomes/lysosomes.

Conclusions: This research attempts to address the functional role of Cst-1 in tumor cell senescence. Does Cst-1 represent a survival factor or is it an effector molecule that partly drives irreversible cell-cycle arrest? To start answering these questions, we present here cells stably overexpressing CST1 and exhibiting intracellular accumulation of the Cst-1 protein. These cells represent important tools for further studies.
Nanodiscs: A tool to Investigate the Membrane Proteins of HIV.
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Background: Major challenge to study the membrane anchored and intergral membrane proteins is to obtain them in a functionally active, water soluble and monodisperse form. This needs incorporation of proteins in native-like membrane or detergent micelle which mimics the properties of biological membrane. Detergent solubilization or reconstitution into liposomes sometimes suffers from aggregation, heterogenicity or loss of protein function. A novel method to handle membrane proteins in a native like, homogeneous environment is to reconstitute an HDL particle called a “nanodisc” to incorporate membrane protein. Nanodiscs have been used successfully to analyse a number of membrane proteins (Leitz et al, 2006, Bayburt et al 2007, Nelson et al 2004).

Hypothesis: The segment NHR (N-terminal heptad repeat) of gp41 plays an essential role in membrane fusion. It forms a trimeric coiled coil. Our hypothesis is that alkylation of this peptide (to mimic palmitolyation, a process by which proteins are modified post-translationally) may improve its functional properties. Incorporation of this alkylated peptide into nanodiscs (a native membrane like environment) will help us to understand the structural and functional aspects of the membrane environment.

Methods: Membrane scaffold protein (MSP1D1) was expressed in E.coli strain BL21(DE3) and expressed protein was purified using Ni-NTA column (Denisov et al). The self assembly was initiated by the removal of detergent. The nanodiscs obtained were purified using Superdex size exclusion chromatography. The NHR of gp41 will be alkylated at the cysteine residue using a thioalkylating agent, octadecyl-dithiopyridine (synthesized from 1-octadecanethiol and 2,2'-dithiodipyridine via disulfide bond formation) as a S-palmitolyation mimic of membrane protein. The alkylated gp41 NHR peptide will be transiently solubilized with a detergent in the presence of phospholipids and MSP1D1. Upon removal of detergent, the alkylated peptide will be assembled with phospholipid into a discoidal bilayer target peptide into nanodiscs will provide us functional and structural information.

Results: A homogenous population of empty nanodisc around 9.2nm was obtained. Incorporation of the provides unique monodispersity, control of oligomerization and native like phospholipid membrane environment to study membrane proteins, in our case gp41, a target for HIV-1 fusion inhibition.

Conclusions: Nanodiscs technology.
Background: Previous studies using vascular occlusion models of ischemia in AD mouse models have reported increased susceptibility of AD mutants to focal brain ischemia. It has been suggested that this may be due to deleterious vascular effects of Abeta with regard to vascular reactivity or inflammation, rather than as a direct effect on neuronal sensitivity to ischemia. It is difficult to test the hypothesis that AD-related genetic mutations have a direct effect on neuronal ischemic sensitivity because differences in cerebrovascular function would make it difficult to ensure that the degree of ischemic insult to neurons in AD models is the same for mutant and wt animals if the insult includes manipulation of the vasculature, as is the case for vascular occlusion models of ischemia. This potential confound can be avoided by using an acute brain slice preparation in vitro.

Methods: We used the in vitro oxygen glucose deprivation model of ischemia in hippocampal brain slices from triple transgenic AD mice to examine the direct effect of ischemia on neuronal function. Hippocampal slices from symptomatic 3xTg-AD mice and age matched WT controls were subjected to OGD by substituting sucrose for glucose (equimolar) in the artificial cerebrospinal fluid bath and substituting nitrogen for oxygen in the atmosphere. Dendritic field excitatory postsynaptic potentials (fEPSP) were recorded in stratum radiatum (SR) of area CA1, evoked by brief stimuli delivered via a bipolar stimulating electrode also placed in the SR of CA1.

Results: Symptomatic (>8 mos.) 3xTg-AD mutant brain slices recover as well as or better from 5 minute OGD than do age-matched WT controls indicating that the neurons in symptomatic stages of AD do not suffer increased sensitivity to ischemia. Of the preparations recovering to >100% of control amplitudes, 3xTg-AD exhibited greater increases in amplitude than WT, which may indicate the induction of anoxic LTP preferentially in a subpopulation of 3xTg-AD preparations. Strongly elevated extracellular [K+] is often associated with the rapid depolarization of neurons during OGD, and coincides with a brief negative DC shift at the tip of the recording electrode. We observed negative DC potential shifts in a lower proportion of 3xTg-AD mutants than WT, indicating possible changes in cellular regulation of ionic gradients and/or currents in the mutant mice.

Conclusions: Our data suggest that the increased stroke risk seen in AD patients might not be directly related to increased neuronal ischemic sensitivity, but might be better explained by indirect mechanisms such as compromised cardiovascular function. The observed changes in electrophysiological responses to OGD may reflect compensatory mechanisms in response to disease state similar to those seen in classic models of ischemic preconditioning. Such compensations may confer direct neuronal protection against stressors such as ischemia without improving vascular deficiencies that might lead to chronic hypoperfusion of AD brains.
Human Embryonic Stem Cells Express a Unique Repertoire of Bcl-2 Family Members.
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Background: Roadblocks to human embryonic stem cell (hESC) based therapeutics include (1) the production of defined cell types at a scale required to meet clinical demand and (2) the limited survival of cells post-transplantation. Cell numbers are determined by the balance of the rates of division and of cell death: Strategies to improve growth could include boosting the rate of division or blunting the rate of cell death. We have focused our studies on the signals that drive hESCs to programmed cell death with the thought that understanding these pathways might well extend to post-mitotic preparations of cells intended for transplantation (e.g. hESC-derived neurons). The decision to die is regulated by a family of related proteins - the Bcl-2 family - that act at the level of the mitochondria. Within this group are molecules that either promote or inhibit cell death. Anti-apoptotic Bcl-2 family members include Bcl-2, Bcl-w, Bcl-xL, Bcl-B, Mcl-1, and A1. Pro-apoptotic Bcl-2 family members include Bax and Bak as well as a group of proteins known as the BH3-only Bcl-2 family which includes Bim, Bid, Puma, Noxa, Bad and others.

Methods: So as to determine which cell death pathways might be most active in hESCs relative to other cell types, we used quantitative PCR to evaluate the basal expression of all members of the Bcl-2 family in hESCs (TE06 and BG01), hESC-derived neural stem cells, seven human primary cell lines including representatives from each germ layer, and two cancer lines. Our hypothesis is that overly abundant Bcl-2 family member transcripts in hESCs would point toward apoptotic and/or anti-apoptotic signaling cascades that are especially active in hESCs. In addition to Bcl-2 family members, we assayed genes that are commonly used as markers of pluripotency and germ layers to serve as an internal control. (Nanog and SOX2 were found to be predominantly expressed by hESCs.)

Results: Our analysis revealed, surprisingly, that expression levels of the pro-apoptotic BH3-only Bcl-2 family members Puma and Noxa are elevated in hESCs compared to other cell-types. The fact that hESCs live while expressing relatively high amounts of the pro-apoptotic molecules Noxa and Puma was surprising; the fact that both Noxa and Puma are regulated by p53 peaked our interest.

Conclusions: What benefit does basal overexpression of Puma and Noxa afford hESCs? Is this expression p53-dependent? If so, what signals are p53 responding to? We hope to answer these and other questions in our future work; doing so should offer insight into the signaling pathways that govern cell survival - insight that undoubtedly will translate to the development of better conditions for both hESC expansion and promotion of cell survival post-transplantation.
Cholinergic Neurons are Nerve Growth Factor Addicts: Can Nicotine Ameliorate Withdrawal?
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Background: The cholinergic neurons of the basal forebrain (BFCNs) are selectively vulnerable in Alzheimer’s disease. These neurons are dependent on nerve growth factor (NGF) for survival, which is supplied by their target neurons in the hippocampus and entorhinal cortex (BFCNs do not make their own NGF). NGF binds two classes of receptors: the p75(NTR) and TrkA, a trans-membrane tyrosine kinase. BFCNs express alpha-7 nicotinic acetylcholine receptors, which are a recent target of Alzheimer’s disease therapeutics.

Hypothesis: Nicotinic acetylcholine receptor agonists (e.g. nicotine) directly extend the survival of cholinergic neurons undergoing nerve growth factor deprivation.

Methods: A cell culture model system of BFCNs was developed using the human neuroblastoma cell line SH-SY5Y, differentiated with NGF and the steroid like molecule Aphidicolin isolated from the fungus Nigrospora oryzae. Aphidicolin inhibits DNA polymerase α and δ and blocks cell cycle at G1-S phase. This protocol induces differentiation and an “addiction to” or “dependence on” NGF, such that withdrawal of NGF induces cell death. Cells undergoing NGF withdrawal and control cells were scored for commitment to apoptotic cell death using a visual methodology. These results were then confirmed by an MTT-based assay.

Results: We present visual and spectrometric assay evidence that nicotinic acetylcholine receptor agonists directly extend the survival of cholinergic neurons undergoing nerve growth factor deprivation.

Conclusion: The results reported here support the idea that nicotinic acetylcholine receptor agonists directly extend the survival of cholinergic neurons undergoing nerve growth factor deprivation. This result is remarkable, since our experiments involved the complete withdrawal of NGF. Indeed, the “trophic” signal produced by alpha-7 nicotinic acetylcholine receptor agonists, and nicotine in particular, through the binding of the alpha-7 nicotinic acetylcholine receptor, completely replaced, for several days, the “trophic” signal usually provided by NGF binding the TrkA/p75 constellation. Therefore, we have shown that alpha-7 nicotinic acetylcholine receptors exhibit the trophic behavior associated with “dependence receptors.” Future work concentrates on examining the other critical property of dependence receptors; namely, the anti-trophic behavior when the receptor is expressed in sufficient concentration and remains unbound. If alpha-7 nicotinic acetylcholine receptors exhibit this second characteristic, we will have discovered the first example of a “neurotransmitter dependence receptor.” This work has application in Alzheimer’s disease research, and in the study of how synapses are formed and broken, in the dynamic processes of learning and memory.
Novel ShethA2 Analogs Differentially Affect Growth of Hormone Dependent Human Prostate Cancer Cells
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Background: Prostate cancer is the second most frequently diagnosed cancer in men in US and also the second major cause of cancer death in men after lung cancer. Due to the nonspecific cytotoxic mechanisms of chemotherapeutic drugs, patients have to endure adverse side effects that negatively impact their quality of life. So chemotherapy in prostate cancer is used as a last resort in advanced stages of the disease. A series of novel ShetA2 analogs have been synthesized in our laboratory aimed at being cytostatic rather than cytotoxic. Here we report the growth inhibitory effects of 4 such analogs. Preliminary results on a couple of these analogs have shown a distinct differential cytostatic effect on three prostate cancer cells in that they are able to inhibit the growth of cells that are androgen dependent without affecting the growth of cells that are androgen independent for their growth. If such cytostatic agents are combined with cytotoxic drugs, in principle, we should be able to lower the dose of the cytotoxic agent while delivering the same therapeutic effect but with reduced adverse effects.

Methods: MTS cell viability assays were carried out using compounds SL-03, SL-06, SL-08 and SL-15 in three prostate cancer cell lines: DU-145 (hormone independent), PC-3 (hormone independent) and LNCaP (hormone dependent).

Results: A dose dependent (0.5-20 μM) decrease in cell viability was observed in LNCaP cell line with all of the four compounds, while cell viabilities of DU-145 cells were not affected by any one of them. Call viabilities of PC-3 cell line were marginally affected.

Conclusions: These results suggest that these ShetA2 analogs cause growth inhibition in hormone dependent cells, while, no such inhibition is seen in hormone independent cells. We speculate that androgen receptors may play a role in regulating the cellular effects of these compounds. Further studies are ongoing to test this hypothesis.
Something From Nothing: Turning a Subunit Vaccine into a Powerful Vaccine Antigen
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Background: Production and safety issue have restricted rapid response vaccine development for emerging pandemic diseases, mainly due to complex pathogen attenuation or viral recombination, selection and production issues. Making a vaccine out of a single pathogen protein has been an attractive alternative to making an attenuated pathogen, because subunit vaccines are expressed directly from genetic information from the pathogen, are safer than producing a whole pathogen, and require only the ability to express protein to produce vaccine material. Unfortunately, soluble proteins are weak antigens, as the mammalian immune system lacks the ability to recognize protein as harmful, even when it is a foreign antigen. Proteins lack the ability to stimulate pattern recognition that is the hallmark of adaptive immune activation to viruses and bacteria, and consequently subunit vaccines have failed to stimulate effective pathogen immunity. Despite their obvious production advantages, subunit vaccines have not been adopted into widespread use.

Hypothesis: Our hypothesis is that a soluble pathogen protein can be made into an effective vaccine antigen by chemical linkage to the plant virus Tobacco Mosaic Virus (TMV). TMV is a rigid rod virus composed of a + strand genomic RNA and ~2000 copies of a single coat protein. TMV linkage will confer the viral characteristics of appropriate size and repetitive antigen display necessary to stimulate pattern recognition and adaptive immunity to a subunit vaccine antigen.

Methods: TMV virus was chemically linked to a viral protein antigen using three different chemistries. Chemical aggregates were also made using the viral antigen alone, or the “gold standard” keyhole lympet hemocyannin (KLH). Mice were immunized by subcutaneous injection of 15ug of unconjugated subunit vaccine protein, TMV-subunit conjugates, KLH conjugates or subunit aggregates without additional adjuvant. Sera was taken post vaccine 1 and 2, and compared to pre-immune sera for anti-pathogen immune responses.

Results: Out of the three TMV subunit conjugates created, two stimulated anti-pathogen immunity after single dose immunizations, with 100 fold boosting after as second immunization. TMV was not an inferior immune activator compared to the KLH gold standard after one dose, and considerably more potent after two doses. Pre exposure to TMV, or repeated TMV-subunit vaccines, did not block boosting, or reduce anti-pathogen responses. Immune responses to the subunit protein alone were not detectable, even after two doses.

Conclusions: We have sucessfully demonstrated “proof of concept” that conjugation of subunit proteins to TMV stimulates potent and unprecedented single dose immune responses. TMV is a not a mammalian pathogen, is inexpensive to produce, and should provide a safe and cost effective basis for rapid vaccine production. Future analysis will include pathogen neutralization, and studies to address whether other pathogen subunit vaccine candidates can also be made into potent vaccines using this method.
Growth Cone Central Domain (C) Length and Width has no Correlation to Xenopus Laevis Retinotectal Axonal Navigation
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**Background:** Appropriate motor and sensory development relies on axonal elongation through diverse tissues to reach synaptic partners located throughout the developing body. This embryonic axonal navigation is accomplished by the motile structure at the distal tip of an elongating neuronal axon called the growth cone - a dynamic, actin-supported extension of a developing axon seeking its synaptic target. The growth cone is described in terms of three regions: the peripheral domain (P), the transitional domain (T), and the central (C) domain. The central domain is primarily composed of a microtubule-based cytoskeleton, is generally thicker, and contains many organelles and vesicles of numerous sizes. Here, we will focus on mathematical analysis on the size and shape of the central domain (C) and their relationship to axonal growth and navigation. No previous studies have been conducted.

**Hypothesis:** We hypothesize that there will be changes in central domain growth cone with axonal navigation (axon position).

**Methods:** The width and length of two growth cone central domains were measured from an in vivo time-lapse video of retinotectal axon pathfinding in Xenopus Laevis recorded by Sonia Witte of Cambridge University. Using Image J, growth cone central domains were marked based on higher intensity of GFP expression by the central domain. The length and width of the central region of the growth cones were measured from these markings. Mean and standard deviations were calculated and compared. Central domain shape changes were also compared.

**Results:** The measurements demonstrated no clear correlation between central domain length and width to axonal navigation. Central domain axon width ranged from 4.170-19.901 um with a mean of 10.017 um and standard deviation of 2.886 um (n= 190, SE = 0.227 um). Right axon length ranged from 0-41.825 um, mean of 21.723um, and standard deviation of 7.166um (n= 188, SE = 0.523um). A small increasing length pattern is observed at the beginning of the in vivo time-lapse video, which led to the eventual decrease. Central domain shapes showed no clear correlations during intermediate time-points.

**Conclusion:** Growth cone central domain length and width did not show any clear correlation to axonal navigation. Central domain shape changes were observed all throughout axonal growth, but no clear conclusion can be made about central domain shape to axonal growth. Further measurements are needed to determine if the initial increase in central domain length is significant.
Lead Optimization of Indole Compound as HIV-1 Fusion Inhibitor Targeting gp41

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Background: Gp41 plays a key role in the early stage of HIV-1 entry process; its hydrophobic pocket within the coiled coil (6-helix bundle) is regarded as an attractive target for small molecule inhibitors. One lead compound has been identified as fusion inhibitor of gp41 through a structure-based drug design approach.

Methods: Lead optimization was carried out including scaffold modification and substituent group replacement at one end of the lead compound. Binding, cell-cell fusion and HIV replication assays were carried out.

Results: The assay results indicated that (6-6’) indole-indole linked scaffold was preferred. Highest binding activity occurred when carboxylic acid was employed, possibly due to an H-bond or salt bridge formation with residues lining the hydrophobic pocket. But dual carboxylic acid containing inhibitor lost biological potency compared to compounds with a single carboxylic acid. Hydrophobic substituent groups could improve biological activity, although substituent position had a weak influence on binding affinities.

Conclusions: In summary, primary lead optimization resulted in improved binding activity and cell-cell fusion inhibitory data. The best compound is the first verified sub-µM HIV-1 fusion inhibitor.
Using NMR at 400MHz to screen for the protein aggregation state of HIV Gp41 ectodomain samples.
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**Background:** Protein samples of the HIV gp41 ectodomain must be assessed for their aggregations state prior to performing drug binding NMR experiments, as these should be performed on monodispersed (not aggregated) protein. When proteins aggregate or even transiently associate, their characteristic NMR spectra change, and these changes can be used to estimate the effective rotational correlation time of the protein. An unexpectedly large rotational correlation time implies the protein has aggregated, and different buffer conditions should be chosen. One method for rapidly estimating the protein rotational-correlation time is to use the difference in relaxation rates of protein amide Nitrogen-15 $\alpha$ and $\beta$ singlet spin transitions. The difference in these relaxation rates originates in the effect known as TROSY (Transverse Relaxation Optimization Spectroscopy), which is famously most pronounced at higher magnetic field-strengths (900MHz). Here we attempt to use TROSY at comparatively low field: 400MHz.

**Hypothesis:** Qualitative screening of protein rotational correlation times using the TROSY effect is feasible at 400MHz, and this allows monitoring of protein aggregation.

**Methods:** Rotational correlation times were measured for two proteins on the Touro University Bruker 400MHz Avance NMR spectrometer. The measurements were performed using the TRACT (TROSY for Rotational Correlation Times) pulse sequence. The proteins tested were a flexibly-linked double-GB1 construct and a modified HIV gp41 ectodomain construct. Data extraction, processing and analysis was performed using in-house numerical python program and NMRPipe software.

**Results:** The estimated rotational correlation times for the double-GB1 and gp41 ectodomain construct were 2.7 ns (25 C) and 13 ns (42 C), respectively. The data was acquired in about 1.5 hours for both proteins. Since both constructs contain flexibly residues, the results are influenced on the fast dynamics these residues, making the actual correlation times lower limits of the domain correlation times.

**Conclusions:** Measurement of rotatational correlation times of two very differently sized (6 kDa and 35 kDa) $^{15}$N isotope labeled proteins at 400MHz is feasable and can be accomplished rapidly. Differences in rotational correlation times due to protein association or aggregation should therefore be detectible in the molecular weight range tested.
CLINICAL SCIENCES
Assessment of Clozapine Plasma Levels on Stable Outpatients with Schizophrenia or Schizoaffective Disorder

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Background: Schizophrenia is a disabling and devastating illness that is characterized by a constellation of psychotic, mood and cognitive symptoms. Rehospitalization amongst patients diagnosed with schizophrenia is common and is often due to the treatment inefficacy and non-adherence. The development of adverse effects also plays a role in compliance and relapse prevention. Newer atypical antipsychotic agents have emerged in the last few decades, including clozapine. These agents have been shown to be clinically effective while carrying a much lower risk of extrapyramidal symptoms when compared to conventional antipsychotic agents. Clozapine has been used for treatment resistant patients with schizophrenia with proven efficacy, and though it is not a common practice to obtain plasma concentrations, the clinical benefits of measuring it include the monitoring of toxicity, drug interactions, adherence with treatment, and therapeutic response. Although, therapeutic serum levels of clozapine have been determined for the treatment of acute schizophrenia, no therapeutic level is established for maintenance therapy. Establishing a therapeutic range in this and implementing monitoring protocols could lead to fewer side effects and increased adherence. The study will assess a correlation between plasma concentrations of clozapine and the Brief Psychiatric Rating Scale scores in an outpatient setting.

Hypothesis: The goal of the study is to find a therapeutic drug level for clozapine maintenance therapy in treatment of schizophrenia. This study hypothesizes the expected plasma concentrations of prophylactic clozapine for patients in an outpatient setting will be below the recommended clozapine level of >500ng/mL for acute schizophrenia.

Methods: Subjects at the Marin County Mental Health System will be invited to participate if they have a DSM-IV diagnosis of schizophrenia or schizoaffective disorder and are currently on a stable regimen of clozapine monotherapy. Subjects must be clinically stable, which is defined as being at the baseline level of functioning and symptomatology for at least three months. Subjects must also be on stable dose of clozapine for at least 10 days. Blood draws obtained for the study must be performed 12-hours after the subjects’ last dose of clozapine.

Results: Pending

Conclusions: Pending
Capillary Glucose Testing After Oral Glucose Load: A Convenient Screening Test for Type 2 Diabetes and Pre-diabetes in Latino Adults

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**Background:** The Centers for Disease Control and Prevention now estimates that 25.8 million people in the U.S. have diabetes. Of these, 7 million are undiagnosed. Moreover, an estimated 79 million adults in the U.S. have prediabetes. Diabetes disproportionately affects the elderly, and there are also significant disparities between ethnic groups. For example, among adults in the U.S., diabetes affects an estimated 11.8% of Hispanics, but only 7.1% of whites. Since risks of complications can be significantly reduced through glycemic control and other measures, there is a need for a practical and reliable tool for early diagnosis of diabetes. Furthermore, it is important to identify prediabetes, since medications and lifestyle changes can prevent or delay progression to diabetes. Yet many of those at high risk are not screened, often due to poor access to laboratory testing or medical care.

**Methods:** Subjects were recruited from among Latino men and women age 45 and over. After an overnight fast, subjects were given a standard 75-gram oral glucose tolerance test (OGTT), with venous blood samples drawn prior to and 2 hours after glucose load. At 2 hours, a simultaneous capillary glucose test (CGT) was also performed, using the Lifescan One-Touch Ultra system. A capillary glucose value of > 140 mg/dL was considered a positive screen. Between 2006 and 2008, a total of 116 subjects were enrolled and completed the study.

**Results:** Subjects with abnormal glucose on OGTT (prediabetes or diabetes): 46 (39.7%)
Previously undiagnosed diabetes: 12 (10.3%)
Prediabetes: 34 (29.3%)

Subjects with abnormal glucose on CGT (pre-DM or DM): 62 (53.4%)
Sensitivity, Specificity, Positive Predictive Value, and Negative Predictive Value of a post-load CGT of ≥140 mg/dL to detect prediabetes or diabetes (compared with OGTT):

- Sensitivity (95% CI): 84.8% (71.1% - 93.7%)
- Specificity (95% CI): 67.1% (54.9% - 77.9%)
- PPV (95% CI): 62.9% (49.7% - 74.8%)
- NPV (95% CI): 87.0% (75.1% - 94.6%)

**Conclusions:** Our findings demonstrate that the use of a single fingerstick capillary glucose measurement after a glucose load appears to be a sensitive tool to screen for prediabetes or diabetes. Of the 116 subjects, 46 (39.7%) were found to have previously undiagnosed diabetes or prediabetes. The capillary test following glucose load identified 39 (84.8%) of these individuals. Clearly this test, will miss a few individuals with abnormal glucose; particularly those with isolated impaired fasting glucose might be missed with only a post-load test. Nevertheless, considering its simplicity and low cost, it seems to be a powerful screening tool. It will initially identify most individuals with prediabetes, who may be candidates for further screening. This test offers significant advantages for the underserved population over a standard laboratory-based OGTT. It requires only an oral glucose drink and a glucose meter.

The assistance of both faculty and students at Touro Colleges of Medicine and Pharmacy are appreciated. Supported by a grant from Lifescan, Inc.
The Ratio Paraoxonase 1 Activity in Small vs. Large HDL Subclasses and Their Apolipoprotein Composition as a Window to Functional Assessment of HDL in Atherogenesis

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Background: Classic gradient gel electrophoresis in conjunction with automated densitometry (measuring relative mass of lipid per fraction) identifies 5 HDL subspecies separable on the basis of particle diameter: HDL3c (7.2 to 7.8 nm), HDL3b (7.8 to 8.2 nm), HDL3a (8.2 to 8.8 nm), HDL2a (8.8 to 9.7 nm), and HDL2b (9.7 to 12.9 nm) Early studies indicated that HDL2, which is strongly correlated with total HDL cholesterol, was most strongly inversely related to CAD risk. However, recent data have challenged the early concept that HDL2 (large, buoyant) are more CAD-protective.

Aims of this study: We have developed a method to examine the antioxidant function of HDL subclasses that has the potential to shed some light on this discrepancy.

Methods: The contents of plasma HDL subclasses were determined by native gradient gel electrophoresis (4-12%, Biorad, Hercules, CA), which is followed by the enzymatic detection of PON-1 hydrolysis of phenylacetate in situ (by means of a coupled reaction with aminoantipyrine and potassium ferricyanide, that quantitatively measures phenol, the product, at 405 nm). In our hands, the method has a CV of 5% (intra-assay) and 10% (inter-assay). HDL subclasses are also analyzed for comparison and control purposes using the Lipoprint HDL system from Quantimetrix (Redondo Beach, CA). The gels are also western blotted and apolipoproteins A, B, E, CII, CIII and PON profiles across HDL subclasses are obtained. We then assessed the relationship between HDL subclass distribution and PON-1 activity in 40 healthy subjects with HDL-C ranging from 25-120 mg/dl (20 males and 20 females).

Results: Based on recent publications indicating that small HDL3 particles perform better as antioxidants, we measured area under the curve for PON-1 activity in HDL2a and b and HDL3c and we report their relative activities as the ratio of PON-1 activity in HDL3c/ HDL2a and b (very small/large HDL particles). Strikingly, the ratio varies from 1.2 to 5. In patients with similar low or high HDL-C and the ratio varies more than 200%.

Conclusions: Our method allows for detection of PON-1 activity in HDL subclasses and shows a striking differential distribution of the activity in different subjects, independent of the HDL-C. Our data show that in otherwise healthy subjects the average activity is higher in HDL3 and HDL2b, which is in agreement with our indirect correlation study using Lipoprint and with published data employing cumbersome ultracentrifugation isolation of subclasses 51,52. Our method may become a practical tool to unravel the functionality of HDL and to predict CAD risk.
Implementation of an Algorithm for Depression Based on the Sequenced Treatment Alternatives to Relieve Depression (STAR*D) Trial in a Ambulatory Safety-Net Clinic

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Background: Major Depressive Disorder (MDD) is a disabling psychiatric illness and is defined by the occurrence of at least a single major depressive episode. The Sequenced Alternatives to Relieve Depression (STAR*D) trial was a multi-center, prospective, randomized control trial with broad inclusion criteria that intended to evaluate the most specific, cost-effective, and practical next step treatment options for treatment-resistant depression. STAR*D provided recommendations on how to start and modify pharmacological therapy for MDD.

Hypothesis: The objective of the study is to evaluate the efficacy of the designed treatment algorithm for MDD. The algorithm, based on the most cost-effective path through the STAR*D treatment levels, will be compared to conventional depression treatment not utilizing the treatment interventions developed by the investigators.

Methods: Eligible participants in our active study arm will be enrolled in treatment level 1 of our study using escitalopram. Escitalopram (maximum dose of 20 mg/day) has been chosen to replace citalopram due to the recent FDA warning concerning the increased risk of QTc prolongation with doses >40 mg/day that is less than the maximum dose of 60 mg/day used in the STAR*D Trials. Participants with an adequate clinical response at 6 weeks will carry out the treatment to 10 weeks. Patients who reach remission at the end of the 10 weeks will enter a 12-month follow-up phase. Participants who do not have a partial clinical response at the end of 6 weeks or remission at 10 weeks will enter treatment level 2, which either switches the patient to sertraline or augments the level 1 treatment, escitalopram, with buspirone. Patient without partial response or reach remission will enter level 3, which either switches the patient to nortriptyline or augments the level 2 treatment sertraline, with T3 thyroid hormone. All participants who do not experience partial response or reach remission after level 3 treatments will enter level 4 and be switched to mirtazapine plus venlafaxine ER.

Results: Clinical response will be measured using the 16-item Quick Inventory of Depressive Symptomatology (QIDS-SR16), rating scale. Response and partial response will be defined as an improvement from baseline of ≥50% and 25-49% respectively. Remission will be defined as a QIDS-SR16 score of ≤5.

Conclusions: Pending
Satisfaction of Patients, Student Providers, and Board of Directors Participating in the Touro University Student-run Health Clinic

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**Background:** The aim of the study was to evaluate the satisfaction of patients, student providers, and student Board members of a free Touro University California Student-Run Health Clinic (TUCA-SRHC) providing medical care to an underserved population in Vallejo, California.

**Methods:** This retrospective study evaluates the satisfaction of various stakeholders of the TUCA-SRHC including patients (n = 164), student providers (n = 86), and 2011-2012 student Board members (n = 5). For providers and Board members, surveys were self-administered using Survey Monkey. Eligibility criteria for student providers included participation from January 1, 2011 through January 31, 2012. Patient satisfaction surveys were self-administered on-site at the SRHC from October 6, 2010 through January 31, 2012. A Likert scale was utilized where 1 = highly dissatisfied and 5 = highly satisfied.

**Results:** Patient satisfaction was high in all areas studied including hours of operation (4.65 ± 0.59), wait-time (4.59 ± 0.54), and quality of treatment (4.93 ± 0.29). Student providers were very comfortable working with patients (4.25 ± 0.71) but did not know what to do when patients needed insurance (2.55 ± 1.13) or prescription coverage (2.42 ± 1.20). Students were neutral with the treatment options and resources made available for patients (3.44 ± 1.02). Participating in interprofessional teams increased student’s satisfaction of participating at the SRHC (4.04 ± 0.91) and overall, students were highly satisfied with their experience at the SRHC (4.19 ± 0.85). The Board was highly satisfied with their experience (4.8 ± 0.44), reported functioning well as a team (4.40 ± 0.54), and believed that the tier leadership structure helped to delegate responsibilities to other volunteers (4.40 ± 0.89).

**Conclusion:** SRHCs serve as an opportunity to provide health care to community members in need while increasing early clinical skills and promoting volunteerism of medical students. To further the mission of the TUCA-SRHC, students must continue to integrate community resources to effectively address patient needs and maintain high levels of satisfaction. Recommendations from results of this study will help direct the current Board with strategic planning. Continued study of patient, student provider, and Board member satisfaction should occur to further the mission of the TUCA-SRHC.
Acceptability of Fluzone Intradermal Vaccine to Patients and Immunizers in the United States
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Background: Influenza is a major cause of morbidity and mortality throughout the world, resulting in thousands of deaths each year in the United States1. In an effort to increase influenza vaccine usage and acceptance, the Intradermal (ID) Influenza Vaccine (Sanofi Pasteur, Inc.) was developed. The ID influenza vaccine is a split virion trivalent influenza vaccine that is delivered by a novel device that utilizes a 2.0 mm, 30 gauge needle. It was licensed in the United States in May 2011 for administration to patients between 18 and 64 years of age. It delivers a smaller volume and antigen load to the immunologically rich dermis, and has an immunogenicity and safety profile similar to the intramuscular (IM) product2.

Hypothesis: The ID vaccine will be well accepted by patients and immunizers in the United States. The smaller needle size, compared to the traditional needle used for IM vaccines, should decrease pre-injection anxiety, decrease injection pain, and may potentially increase vaccination rates. Immunizers will most likely prefer to deliver the influenza vaccine via the intradermal (ID) route over the IM route due to the simple method of delivery and decreased patient anxiety.

Methods: Our study involved 249 adult subjects, and was designed to measure the acceptability of the intradermal vaccine to patients and immunizers in the United States. Surveys were given to all of the subjects immediately following the ID influenza vaccine and again 1 week after their injection. These surveys documented the subjects’ levels of anxiety, pain, side effects and preferences.

Results: Overall ID vaccine satisfaction among patients was 99.6%. The majority of subjects (53.8%) that had received an intramuscular influenza vaccine in the last three years, rated injection pain as better with the ID vaccine in comparison to the IM vaccine. Seven days post-injection, 56% of the subjects reported less injection anxiety with the ID vaccine in comparison to the IM vaccine. The majority of patients (55.5%) reported that they would prefer the ID vaccine next season. All (100%) of the experienced vaccine administrators reported being satisfied with the ID vaccine. Reasons for their vaccine satisfaction included potential improvement in vaccine safety in terms of patient and administrator needle stick injuries, as well as ease of administration and decreased time to administer the vaccine.

Conclusions: We conclude that the ID influenza vaccine is well accepted by both patients and immunizers in the United States. It offers a vaccine sparing strategy, should be better accepted by those patients with needle phobia, and offers the potential to minimize needle stick injuries. We feel that this technique of vaccine administration will grow as patients and health care providers become more aware of its advantages.

1 CDC. MMWR, Estimates of Deaths Associated with Seasonal Influenza – United States, 1976-2007. 59(33); 1057-1062, August 27, 2010
CASPASE-12 Genotype Influences the Expression of Systemic Lupus Erythematosus in African-Americans

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Background: The CASPASE-12 (CASP12) protein modulates both the inflammatory process and the cellular apoptotic pathway. However, most humans lack a functional CASP12 gene. A truncated pseudogene (CASPI2p1) resulting from a premature termination mutation is found in all Caucasians and East Asians examined, and in 80% of people of African lineage. The functional, non-truncated CASP12 allele is present in approximately 20% of persons of African descent. The functional allele is a risk factor is persons of African descent due to its ability to down-regulate inflammatory cytokines. Systemic lupus erythematosus (SLE) is a serious and complex autoimmune disease affecting multiple organ systems and is most common in African-American (AA) women. Thus CASP12 may offer some protection against SLE.

Hypothesis: CASP12 may be protective against SLE due to its anti-inflammatory functions.

Methods: CASP12 was genotyped using DNA from 596 AA SLE patients and 296 healthy controls from the Lupus Family Registry and Repository. Statistical analyses were performed using R statistical software program comparing CASP12 genotype with the eleven diagnostic criteria for SLE from the American College of Rheumatology (ACR).

Results: In the overall analysis of all cases vs. all controls, there was a significant association between homozygosity for CASP12 and protection against serositis (208 SLE cases vs. 295 controls, p < 0.04502). When analyzing only male SLE cases (32) vs. male controls (79), CASP12 appears to be protective against development of arthritis (p < 0.04728), and for only female SLE cases (199) vs. female controls (216), CASP12 was again significant for protection against serositis (p < 0.03302). When comparing case vs. case for all ACR criteria, patients (208) vs. controls (274) was once more significant for a protective effect against serositis (p < 0.03915), indicating that the original serositis result seen in SLE cases vs. controls is driven by the serositis and is not just an association with SLE. The case vs. case analysis for males only found significance with arthritis.

Conclusions: The results indicate that CASP12 is protective against two different manifestations of SLE in African-American patients, with a possible gender influence for arthritis.
Soluble Receptor for Advanced Glycation End Products Correlate Negatively with BMI in Patients with End-stage Renal Disease Undergoing Hemodialysis: A Mechanism for the Obesity Paradox?

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Background: Advanced glycation end products (AGEs), a heterogeneous group of adducts formed on proteins, lipids and nucleotides by oxidative and carbonyl stress, linked with inflammation, accumulate in the serum of patients with a variety of disorders, notably including ESRD. Earlier studies for ESRD patients on HD demonstrated that circulating sRAGE levels are increased and that low levels of sRAGE are predictors of future cardiovascular mortality among these patients.

Aims: To investigate the correlation between sRAGE and clinical parameters such as BMI and lipids among ESRD patients on HD.

Methods: This study included 33 ESRD patients on HD (12 male and 18 female, mean age: 64 years, median duration of HD: 5 years). Clinical parameters were measured after an overnight fast in the pre-HD. In addition to BMI, serum lipid panels such as total cholesterol (TC), TG and high-density lipoprotein cholesterol (HDL-C) were measured using enzymatic methods. Serum sRAGE was measured by an enzyme-linked immunosorbent assay using the Quantikine Human RAGE Immunoassay (R&D Systems Inc., Minneapolis, MN, USA).

Results: The univariate correlation analysis showed that sRAGE was significantly and inversely correlated with BMI and TG. A subsequent stepwise multiple regression analysis for sRAGE revealed an independent, significant and inverse correlation between sRAGE and BMI only ($\beta = -0.42, p = 0.01$).

Conclusions: We show an independent, significant and inverse correlation between circulating sRAGE and BMI during the pre-HD period in ESRD patients on HD. It may be wise to follow this inverse association between sRAGE and BMI over time, because of the debate regarding the obesity paradox (in some series dialysis patients with higher BMIs have been reported to have a better chance of survival than those with lower BMIs). Is it because they have less inflammatory sRAGEs? A significant increase of circulating sRAGE levels in ESRD patients on HD has been previously reported and this was confirmed in our present study. It remains unclear whether the increase of sRAGE is caused by the up-regulation of RAGE to prevent cell/tissue damage by inflammatory and oxidative molecules such as AGEs or whether the increase is simply based on the decline in renal clearance. Future studies are warranted to elucidate the biological mechanisms of the association between sRAGE and BMI.
Circulating Soluble Receptor for Advanced Glycation End Products is Inversely Correlated to Oxidized Low-density Lipoproteins in Healthy Subjects
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Background: There is mounting evidence that circulating soluble RAGE (sRAGE) exert anti-atherogenic effects by acting as decoys abolishing the RAGE signalling. A recent experimental study has reported that oxidized low-density lipoprotein (oxLDL) can be one of the RAGE ligands. Thus, sRAGE are considered emerging important markers in atherogenesis and CVD. The interaction of oxLDL with RAGE, is of great interest; however, there are no clinical data to show whether there is an association between circulating sRAGE and oxLDL levels.

Aims of this study: The present study thus set out to investigate the correlation between sRAGE and malondialdehyde-LDL (MDA-LDL), as an oxLDL marker [9], in asymptomatic subjects.

Methods: Clinical data, including the conventional atherosclerotic risk factors, serum sRAGE and malondialdehyde-low-density lipoprotein (MDA-LDL), were measured in 33 asymptomatic subjects (15 male and 18 female, mean age 65 years). The serum malondialdehyde-low-density lipoprotein (MDA-LDL) was measured by an enzyme-linked immunosorbent assay (Sekisui Co. Ltd., Tokyo, Japan) with intra- and inter-assay coefficients of variation of 6.5% and 9.0%, respectively [9]. The serum sRAGE was measured by an enzyme-linked immunosorbent assay (R&D Systems Inc., Minneapolis, MN, USA).

Results: The mean levels were sRAGE 1101 ng/L and MDA-LDL 70 U/L, respectively. A simple linear regression analysis showed that there was a significant inverse correlation between sRAGE and MDA-LDL (r = −0.36, P < 0.05). A stepwise multiple linear regression analysis also identified MDA-LDL to be a variable correlated independently, significantly and inversely with sRAGE (β = −0.36, P < 0.05).

Conclusions: The inverse correlation between circulating sRAGE on oxLDL suggests that part of the anti-atherosclerotic effects of sRAGE may be related to oxLDL quenching. Further studies are required to confirm the observed relationship.
Circulating Soluble Receptor for Advanced Glycation End Products Increases After a Cerebrovascular Accident and May be a Marker for Encephalic Inflammation: A Follow-up Pilot Study

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Background: Circulating levels of soluble receptor for advanced glycation end products (sRAGE) have been proposed as biomarkers of cardiovascular disease (CVD). In the brain, RAGE is present on neurons, glia, and endothelial cells. In ischemic and other strokes, the necrotic core is surrounded by an area of inflammation, in which tardy cell death exacerbates the early insult. The RAGE ligand high mobility group box 1 (HMGB1) was shown to be elevated in serum of stroke patients and released from ischemic brain tissue in a mouse model of cerebral ischemia. No follow-up study of sRAGE excursions after cerebrovascular accidents has been reported so far.

Hypothesis and aims: We tested the hypothesis that sRAGE increase after a cerebrovascular episode in humans and thus be a marker of brain inflammation.

Methods: Twenty patients from the Neurosurgery Department of Showa University Northern Yokohama Hospital were enrolled. Among them, consecutive blood samples during admission were obtained for 13 patients (5 ischemic, 5 hemorrhagic, 3 acute brain diseases of other etiologies). Sera were obtained on admission within 48 hours after the onset, and compared to those obtained after admission for up to 30 days. Sera from healthy adult volunteers were obtained from Showa University Northern Yokohama Hospital workers, 15 males 15 females, mean age 33.1 ± 11.4 y. As controls, individual day-to-day variation of sRAGE was measured in healthy subjects for up to 2 weeks. The serum sRAGE was measured by an enzyme-linked immunosorbent assay (R&D Systems Inc., Minneapolis, MN, USA). The intra- and inter-assay coefficients of variation were 2.6% and 7.6%, respectively.

Results: At onset the mean levels of sRAGE were 1101 ± 502 ng/ml and no significantly different than the control population. sRAGE showed a consistent increase in levels (from 150 to 200% above onset levels) after the first week, peaking at the second week. Both ischemic and hemorrhagic strokes displayed a similar pattern. The biological variation of sRAGE shows a CV of only 11%. Patients with acute brain illness but no stroke showed no significant changes.

Conclusions: We provide evidence for the first time that sRAGE increase after CVA in humans, in a pattern compatible with onset of necrotic cell death and suggesting a contribution of RAGE to inflammation and ischemic brain damage. In stroke, soluble mediators from the necrotic core area may diffuse to the contiguous penumbra and elicit a deferred inflammatory response that plays a role in neuronal necrosis. If confirmed in larger series, the HMGB1-RAGE mechanism linking necrosis with macrophage activation may provide a target for anti-inflammatory therapy in stroke.
The Effect of Meal Carbohydrate Content on \textit{de novo} Lipogenesis of Chylomicrons and Very Low-density Lipoproteins

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\textbf{Background:} Diets high in fructose have been shown to cause both an increase in triglycerides and in small-dense low density lipoproteins (sdLDL), two known risk factors for cardiovascular disease. Hepatic \textit{de novo} lipogenesis (DNL), the hepatic conversion of excess carbohydrates to fat, may be a mechanism that influences the production of triglyceride-rich very low-density lipoproteins (VLDL) particles. Unlike lipids produced in the liver, dietary fat is combined with the apolipoprotein B48 in enterocytes to form chylomicrons that will contribute to circulating lipid profile. Determining how dietary fats and carbohydrates modulate the kinetics of both chylomicrons and VLDL particles in the blood and affect the lipid profile is the aim of this study.

\textbf{Hypothesis:} A meal that derives a majority of its energetic value from carbohydrates will lead to increases in VLDL production induced by DNL. Clearance competition between newly synthesized VLDL and diet-produced chylomicron particles will create potentially detrimental lipid profiles promoting cardiovascular disease.

\textbf{Methods:} Over the course of 14 days, a subject consumed two different diets, each lasting 7 days: one in which morning meals consisted primarily of carbohydrates as the primary energy source (dissociated diet), and another in which meals consisted of a mixture of fat, carbohydrates, and proteins (mixed diet). An infusion of stable isotope was administered over the course of the study day. Gas chromatography mass spectroscopy (GCMS) was used for mass isotopomer distribution analysis (MIDA) of isotopic enrichments of fatty acids from chylomicron and VLDL particles.

\textbf{Results:} Preliminary data suggests that fractional DNL was higher in subjects consuming a dissociated diet where a majority of the nutritional energy was derived from carbohydrates. Further data indicates that elevated DNL, calculated from circulating lipid particles, persisted even when proteins or fats were the primary source of nutritional energy, despite the relative absence of dietary carbohydrates throughout the second part of the day.

\textbf{Conclusions:} This study will greatly benefit from concurrent examination of the flux of glycerol levels occurring in the plasma. Understanding the relationship between these glycerol levels and the fractional content of VLDL particles that was derived from DNL will allow us to provide a more definitive conclusion on the absolute amount of hepatic DNL actually occurring. Although further rigorous analyses are still in progress, the elevated levels of DNL observed during the dissociated diet suggest that the high quantity and frequency of carbohydrates ingested (per unit time) may be the main determinant of the amount of excess carbohydrates that were ultimately funneled into DNL. These findings may be useful to help propose dietary guidelines that alter carbohydrate intake to avoid worsening lipid profiles and to promote cardiovascular health.
Paraoxonase 1 and Ischemia Modified Albumin Excursions After a Cerebrovascular Accident: A Follow-up Pilot Study
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Background: In cerebrovascular disease, the nervous system is exposed to ischemic conditions due to the lesion proper, respiratory disorders and vascular spasms. In ischemic and other strokes, the necrotic core is surrounded by an area of inflammation, in which tardy cell death exacerbates the early insult and oxidative stress. Paraoxonase-1 (PON1) is an esterase enzyme carried by high-density lipoprotein which exerts protective effects against oxidative damage. Ischemia-modified albumin (IMA) is a biomarker for cardiac and other tissue ischemia.

Hypothesis and Aims: We hypothesized that, as a consequence of the necrosis-inflammation-oxidative stress induced by a stroke, PON1 activity decreases after a stroke while IMA increases. Since serial serum PON1 and IMA measurements in stroke have not been reported, we conducted this pilot study to explore their excursions after a stroke

Methods: Twenty patients from the Neurosurgery Department of Showa University Northern Yokohama Hospital were enrolled. Among them, consecutive blood samples during admission were obtained for 13 patients (5 ischemic, 5 hemorrhagic, 3 acute brain diseases of other etiologies). Sera were obtained on admission within 48 hours after the onset, and compared to those obtained after admission for up to 30 days. Sera from healthy adult volunteers were obtained from Showa University Northern Yokohama Hospital workers, 15 males 15 females, mean age 33.1 ± 11.4 y. As controls, individual day-to-day variation of IMA and PON1 was measured in healthy subjects for up to 2 weeks. PON1 activity was determined using paraoxon, dihydrocoumarin and phenylacetate as substrates. IMA was measured in serum by the decrease in cobalt 2+ binding.

Results: PON activity showed a consistent decrease in levels (from -10 to -40%) below onset levels during the first days, returning to previous values in a week mirroring recovery (p <0.01). Those changes were paralleled by opposite excursions in IMA (from 20-60%) above onset levels (p <0.01). Both ischemic and hemorrhagic strokes displayed a similar pattern. The biological variation of either PON1 or IMA shows a CV of only 8-16%. Patients with acute brain illness but no stroke showed trends but no significant changes. In 2 patients with longer follow up, recovery to normal values and reinfarction, IMA and PON1 changes reflected the events.

Conclusions: Our data show for the first time that IMA increases after CVA in humans, in a pattern compatible with onset of cell death and free radical damage, while PON1 activity decreases suggesting that both markers together could be selected for further studies addressing the predictive value of a ratio delta IMA/delta PON1. PON1 changes may be due to acute phase changes in HDL, to free radical damage to PON1, to PON1 dissociation or to all of these factors combined. These issues will be the subject of further studies.
Education & Outreach
Interdisciplinary Faculty Attitudes Regarding Interprofessional Education
CAPSLEAD Team, College of Pharmacy, Touro University of California, Vallejo, CA 94592; Email:
David.Lash@TU.edu

Background: Interprofessional education (IPE) represents a relatively recent paradigm shift in the education of healthcare professionals. National associations of Colleges of Nursing, Medicine, Pharmacy, Dentistry and Public Health have all stated support and developed core competencies for IPE collaborative practice. However, comparisons of attitudes among faculty from different disciplines (interdisciplinary) regarding IPE remain unstudied.

Hypothesis: Perceptions between faculty within a discipline (intradisciplinary) are more concordant than perceptions between faculty of different disciplines (interdisciplinary).

Methods: A survey to measure perceptions of IPE (5 point Likert-type) was developed and administered to faculty within the College of Osteopathic Medicine (COM), College of Pharmacy (COP), and Physician Assistant (PA) program at Touro University-California. A total of 62 faculty surveys were completed and included in the final analysis, representing over a 60% final response rate. Participation rates were relatively similar across the three disciplines.

Results: Faculty in the three health professional programs rated IPE as valuable and beneficial to their student’s education. While faculty from all three programs agreed that they would like to see more IPE opportunities, COM (n=21) faculty rated the importance of IPE significantly lower in comparison to COP (n=34) and PA (n=7) faculty (COM=3.3 ± 1.2 vs. COP=4.0 ± 0.8 vs. PA=4.6 ± 0.8, p<0.01). Similarly, COM faculty perceived greater difficulty in the implementation of IPE into their current curriculum and reported significantly less support within their own college for IPE relative to faculty in the COP and PA (COM=3.5 ± 0.9 vs. COP=4.0 ± 0.9 vs. PA=4.7 ± 0.5, p<0.05).

Conclusion: As suggestive in the name, IPE requires cooperation and agreement from faculty from multiple disciplines. Despite the limitations inherent in self-reported surveys, results from this single study suggest that interdisciplinary differences in faculty opinion regarding IPE do exist. Whether these differences create barriers to the successful implementation of IPE, and the impact of these potential differences on student IPE learning within the different disciplines warrant further study.
Examination Item Evaluation and Proposed Tool to Identify Outliers for Review
Glenn Davis¹, Gregg Lund¹.
¹Office of Academic Affairs, Touro University College of Osteopathic Medicine, Vallejo, CA

**Background:** Many commercial multiple choice examination scoring programs provide item analysis statistics. However, use of these data to improve items is inhibited by a lack of standardized guidelines and procedures to interpret the statistics and identify outliers. In addition, a formal process to identify locally desirable item characteristics is valuable because criteria of quality are likely to vary across institutions according to differences in curriculum and faculty intent. Having an automated, electronic method to identify outliers would allow for easier detection by users with uneven levels of skill interpreting item analysis according to local standards.

**Hypothesis:** Through a consensus driven model we can develop 1) criteria of multiple choice item quality and 2) an automated procedure to evaluate item analysis.

**Methods:** Review of relevant literature on item response theory was used as the context for developing the initial set of item analysis criteria. For this pilot, data were obtained from the following: a multiple choice test was administered using ExamSoft® v.10 (ExamSoft Worldwide, Inc.) electronic test system at the Touro University College of Osteopathic Medicine. The data were downloaded from SoftScore Web (ExamSoft Worldwide, Inc.) the electronic examination results analysis component of ExamSoft, and imported into spreadsheets (Excel® 2007, Microsoft). These data were exposed to the pilot item analysis criteria (Table1). This analysis was then available for review in tabular and graphical formats.

**Results:** Items were identified that did not fulfill criteria listed below

**Conclusions:** We were able to 1) design the initial draft for the development of consensus defined quality criteria of multiple choice items and 2) display these data so items that do not meet criteria are easily identified. Future use will be to employ this tool to identify the usefulness and to refine the criteria, though college-wide consensus.

**Table1:** Proposed Item Analysis Criteria

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Difficulty Index: % of Students getting question correct (&quot;Diff(p)&quot;&quot;)</th>
<th>Discrimination: Item Point Biserial</th>
<th>Distractor Point Biserials</th>
<th>Distractor plausibility</th>
<th>How many options were correct?</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROPOSED CRITERIA</td>
<td>Between 60% and 85%</td>
<td>Greater than zero</td>
<td>Each less than zero</td>
<td>#selected greater than zero</td>
<td>Only one</td>
</tr>
</tbody>
</table>
Impact of a Pharmacist-Managed Diabetes Clinic to Improve Glycemic and Cardiovascular Care
Eric J. Ip, Pharm.D.1,2, Bijal M. Shah, B.Pharm., Ph.D.1, Junhua Yu, Ph.D.1, James Chan, Pharm.D., Ph.D3,
1Touro University, Vallejo, CA; 2Kaiser Permanente Mountain View Clinics, Mountain View, CA; 3Kaiser Permanente Northern California Pharmacy Outcomes Research Group, Oakland, CA

Background: Adequate diabetes care poses a challenge in the face of primary care provider shortages in the United States. Clinical pharmacists have become increasingly involved in direct patient care and medical management of diabetes patients.

Objectives: To determine if a pharmacist-managed diabetes clinic in a primary care setting will improve hemoglobin A1C (A1C), LDL cholesterol levels (LDL-C), and blood pressure (BP) measurements in type 2 diabetes (T2DM) patients over a one-year period compared to baseline.

Methods: Patients with T2DM who were older than 18 years and had at least one encounter with a clinical pharmacist at Kaiser Permanente Mountain View Clinics were included. Via collaborative agreement with the primary care team, the clinical pharmacist had the ability to initiate and adjust medications, order appropriate laboratory work, and provide diabetes education. Patients with type 1 diabetes, A1C < 7% at baseline, and patients who discontinued Kaiser Permanente health insurance during the study time frame were excluded. Electronic medical records from the period of June 2007 to February 2010 were reviewed and the following data were collected: age, sex, ethnicity, smoking status, height, weight, duration of diabetes, number of encounters (in clinic or via phone follow-up), lab values (A1C, LDL-C, BP at baseline, 3, 6 and 12 months), co-morbid conditions, and list of medications. Comorbidities were assessed using the Charlson comorbidity index. Data were analyzed using SPSS vs. 14.

Results: A total of 203 patients from the pharmacist-managed clinic met the criteria for inclusion in the study. The mean age was 56.7 years, 60% were male, and 48% were non-Hispanic Whites. The mean BMI was 33.1 kg/m² and the patients had a history of T2DM for 6 years on average. Mean A1C values decreased from 9.9% at baseline to 7.3% at 6 months and to 7.1% at 12 months (p<0.001). Mean LDL-C values decreased from 109 mg/dL at baseline to 86 mg/dL at 6 months and to 81 mg/dL at 12 months (p<0.001). Mean systolic BP values decreased from 131 mmHg at baseline to 129 mmHg at 12 months (NS). Mean diastolic BP values decreased from 73 mmHg at baseline to 71 mmHg at 12 months (p<0.04). A pharmacist-managed diabetes clinic in a primary care setting decreased A1C and LDL cholesterol values significantly. The change in BP was marginal

Conclusions: Pharmacists can be a valuable member of the primary care team for the management and care of patients with T2DM.
Developing 2012 Biotech Academy-Touro Summer Internship for High School Students in Vallejo.
Christy Murphy, Ghazal Ghafari, Daniel Lim and Shin Murakami.
Department of Basic Sciences, College of Osteopathic Medicine, Touro University, California, Vallejo, CA.

**Background:** Based on Touro COM’s strategic planning efforts (Community and State Service), we will provide internships for High School (HS) students who are academically motivated to learn university-level research alongside current professionals in this area.

**Hypothesis:** Increased exposure to biomedical research will create a challenging but stimulating opportunity for students in the areas of STEM. The exposure will uncover new areas of career opportunities and/or guide them towards interests in research.

**Methods:** This competitive program will provide full immersion in the laboratory environment. Students will be guided by internship mentors and faculty to learn biomedical topics different disciplines, develop technical and analytical skills, and receive an in depth understanding of the scientific process. In 2012, we have worked closely with the Biotech Academy, Vallejo High School to learn about the needs of the local HS. We had six workshops with and provide mentorship to the HS students. We solicited to have several faculty members/groups to assist in internship.

**Results:** (1) Barriers for HS students were due to financial needs and academic/social support; (2) Strong interest was observed in health sciences but there was lack of knowledge of the wide range of areas; (3) HS students became increasingly interested when options of financial availability presented i.e. scholarships; (4) They became increasingly interested by learning paths of others in HS and/or college to obtain degree/scholarship or succeeded in studying areas of science; (5) They were interested in getting opportunity to speak with professors and current students in profession of interest; (6) Some became interested in other areas of science related research.

Positive outcome was observed of increased enthusiasm for extracurricular activities that facilitate leadership.

**Conclusions:** Continued exposure and awareness about college and career options should increase students drive and determination. Faculty and Touro students are willing to assist in activities but limitation in schedule, and availability. Further survey and evaluation of outcomes for measure of success.
An Academia Advanced Pharmacy Practice Experience (APPE) and its influence on pharmacy career choice

Adrian Jason L. Palisoc (PharmD Candidate), Julie T. Truong (PharmD), Debra Sasaki-Hill (PharmD), Robert J. Ignoffo (PharmD, FASHP, FCSHP)

1. Touro University, Vallejo CA.  2. Touro University, Vallejo CA.
3. Touro University, Vallejo CA.  4. Touro University, Vallejo CA.

Purpose: To determine whether completing an academic Advanced Pharmacy Practice Experience (APPE) at Touro University California College of Pharmacy influenced students to pursue a career in academia.

Methods: Two separate surveys were distributed to 25 students who completed an academic APPE and to 12 faculty preceptors. The survey collected information regarding academic APPE activities, its impact on career choice, and skills learned from the APPE.

Results: The faculty and student responses both show that teaching and service activities were the most common activities during the APPE. Upon completion of the rotation, an additional four students reported interest in pursuing an academic career. The majority of students who completed an academic APPE felt more confident in their service, teaching, communication and research abilities. Teaching and research activities performed during the academic APPE were considered most valuable during postgraduate training. Only one alumni holds a faculty position at a college of pharmacy.

Conclusion: This study shows that even though some students did not have the initial desire to pursue a career in academia, completing an academic APPE can influence students to choose an academic career path. The skills utilized during the APPE such as teaching and research may better prepare students for postgraduate training, lifelong learning and becoming well-rounded pharmacists. Study results may encourage colleges and schools to consider offering academic APPEs.
Cost-effectiveness of Pharmacist Care for Diabetes: Effects on Cardiovascular Outcomes
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2. Department of Pharmacy Practice, Touro University- California College of Pharmacy; Department of Internal Medicine, Kaiser Permanente Mountain View Clinics
3. Pharmacy Outcomes Research Group, Kaiser Permanente Northern California

Background: Clinical benefits of pharmacist intervention programs for patients with Type 2 diabetes mellitus (T2DM) has been documented in previous studies. However, few studies have used control-intervention group comparison as a strategy to identify the effects of pharmacists intervention on long-term cardiovascular (CVD) outcomes. Even fewer studies have evaluated the economic costs and benefits of such intervention programs.

Hypothesis: (1) Adding pharmacists' intervention to the traditional primary care physicians(PCP) team reduced the long-term CVD risk for patients with T2DM. (2) It is cost-effective for health insurers to add pharmacists to the PCP team to improve the management outcomes.

Methods: Data were collected from medical charts at Kaiser Permanente (KP) clinics. Patients in the ECG were matched 1:1 to patients in the control group based on age, gender, HbA1C, and Charlson comorbidity score. The UKPDS risk engine was used to estimate the 10-year CVD risk. A Markov state-transition model was developed to simulate the difference in CVD risk between the two hypothetical cohorts of ECG and control group. The primary outcome was the incremental cost and effectiveness measured by life years and per quality-adjusted life year (QALY) gained. Sensitivity analysis(SA) was conducted to examine the robustness of the results.

Results: The base case model suggests that the ECG dominated the control group with lower treatment cost ($35,740 vs. $44,528) per patient and more life years (8.9 vs.8.1) and QALY (5.51 vs. 5.02) over the 10-year period. However, within the reasonable range of variability of all parameters, the multiple one-way SA revealed that the relative value of ECG depends on the time horizon adopted by the payers. The probabilistic sensitivity analysis suggests that when adopting a longer time horizon such as 5 or more years in management, the ECG has a far higher chance of being chosen as a cost-effective strategy regardless of the level of willingness to pay. However, when the time horizon was shortened, the likelihood for the ECG being cost-effective decreased.

CONCLUSIONS: Adding pharmacists to the health care management team for diabetic patients can be a feasible strategy in terms of the costs incurred and the benefits achieved over the long term.
OSTEOPATHIC
MANIPULATIVE
MEDICINE
Affect of Student Workshop on Osteopathic Medical Students Comfort Discussing Osteopathic Manipulative Treatment (OMT) Use With Attending Physicians
Angela Branda DO\textsuperscript{1}, Stacey Pierce-Talsma DO, MS\textsuperscript{1}, Heather Ferrill DO, MS\textsuperscript{1}, Mitchell Hiserote DO\textsuperscript{2}, Gregg Lund, DO, MS\textsuperscript{2,3}.
\textsuperscript{1}Department of Osteopathic Manipulative Medicine, University of New England Osteopathic Medicine, Vallejo, CA College of Osteopathic Medicine, Biddeford, ME. \textsuperscript{2}Department of Osteopathic Manipulative Medicine and \textsuperscript{3}Office of Academic Affairs, Touro University College of

\textbf{Background:} Studies have demonstrated a decreased utilization of OMT by Osteopathic physicians, residents, and students. While OMT is not the entirety of Osteopathic Principles and Practice, it is an important component. Factors identified as potentially contributing to this decrease include: time constraints, adequate treatment areas, and comfort performing OMT. We have previously demonstrated approximately 66\% of first and second year OMS use OMT outside of school time, demonstrating significant interest and confidence. It is unclear why this early student interest does not translate to later OMT use. Empirically, training sites for third and fourth year Osteopathic Medical Students (OMS) do not offer an adequate number of attending Physicians using OMT. In this setting, not only is OMT use not modeled, but the student must initiate the conversation to use OMT. It is unclear how often and how well OMS do this. To compound the problem, others have reported 21\% of OMS stating they were discouraged from using OMT, by their attending physicians. It was our belief that students are uncomfortable initiating these conversations, and may not have the framework needed for success when they do initiate them. This led to development of this student workshop with the hypotheses: 1) many students were uncomfortable discussing and encouraging OMT as a viable modality with their clinical attending and 2) training might improve this comfort level. This is all with the long term goal to increase OMT use during training, and result in higher utilization as Osteopathic physicians.

\textbf{Methods:} Subjects were OMS attending the workshop “How to Discuss Using OMT on Your Clinical Rotations with Your Attending” at the American Academy of Osteopathy 2012 Convocation. The workshop consisted of: 1) presentation of a conceptual model for the clinical discussion, 2) resources for background information, 3) clinical cases describing typical patient presentations and stereotypical clinical attendings (including their experience and attitudes related to OMT) and 4) using these cases, OMS practiced the discussions through peer role-playing. During the role-playing segment, OMS were divided into dyads and alternated the roles of the attending and OMS. Following the workshop an anonymous paper based survey was administered. This survey included: demographics, previous experience discussing and encouraging use of OMT with their attendings, level of comfort and success in these discussions, and factors associated with discussion comfort variability. Comfort levels were described as 1=Very Uncomfortable to 5=Very Comfortable.

\textbf{Results:} All participants completing the workshops returned the survey (n=53), though not all students answered every question. OMS represented 18 different COMs encompassing all years of training. Of the students who answered, 22\% had been denied permission by attending(s) to perform OMT. For the entire group the mean Pre-workshop
The comfort level was 2.7 with 42% describing themselves as either Very Uncomfortable or Uncomfortable. Workshop resulted in an increased comfort level by almost 50% (2.7 to 3.9). These data are presented in the chart below.

**Conclusion** – A large percentage of students are uncomfortable discussing and encouraging the use of OMT as a viable modality with their attendings. Initial workshop results are promising, indicating that training may increase student comfort with these conversations. Further development of the training is needed with follow-up to determine if improved comfort persists, transfers to the clinical setting, and results in increased OMT use at both the student and ultimately the licensed physician level.
Unfurling the Flag Abroad: A Demonstration of Osteopathic Principles and Practices for Obstetric Patients in Ethiopia

Christopher Kargel¹, Anita Showalter², Janet Burns³, Abinet Sisay⁴
¹. Touro University, Vallejo, CA  ². Pacific Northwestern University, Yakima, WA. ³. Touro University, Vallejo, CA. ⁴. Debre Markos Hospital, Debre Markos, Ethiopia.

Background: Ethiopia represents a unique combination of opportunities by holding such statistics as the highest maternal mortality rates in the world as well as an extensive history of indigenous medical practices that include early forms of medical manipulation. The Ministry of Health and the local physicians have demonstrated excitement for approaches like physiotherapy that extend beyond the allopathic model for addressing their grave concerns. New research indicating that novel interventions like delayed cord clamping can have considerable effects in developing countries and demonstrations of the effects of OMM on obstetric patients indicate that interventions in areas like Ethiopia stand to provide profound benefit to the population.

Hypothesis: Taking advantage of burgeoning programs in both Touro University's Global Health Program and at Debre Markos Hospital in Ethiopia, a small group attempted to demonstrate the advantages of managing obstetric patients utilizing Osteopathic Medical Manipulation (OMM) to the staff of the hospital. The project proposed to study the possibility of such an endeavor by gauging the interest and aptitude of a small selection of staff at Debre Markos Hospital while demonstrating the possibilities of future training to the Debre Markos Hospital and University representatives.

Methods: The initial one-week program aimed at demonstrating first-hand the possibilities of osteopathic management to the staff at Debre Markos Hospital. As the local university plans on opening a Faculty of Medicine in the coming year, the potential was discussed of opening formal training in osteopathic principles and practices to the medical students of the university who will conduct their clinical training at Debre Markos Hospital. The demonstration occurred over the late afternoon hours in an attempt to minimize a disruption of patient care. The curriculum consisted of about one hour of didactic information and approximately one hour of hands-on demonstration. The four days included introductions to the principles and practices of osteopathy, palpatory exercises, and demonstrations of basic techniques such the suboccipital release, round ligament counterstrain, muscle energy to the pelvis, and Still technique for the sacroiliac joint. At the end of demonstration, the participants were given a written survey evaluating their perspective.
### Results:

<table>
<thead>
<tr>
<th></th>
<th>Average Rank</th>
<th>SD</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of Osteopathy (before)</td>
<td>2.594</td>
<td>2.139</td>
<td>0.535</td>
</tr>
<tr>
<td>Awareness of Osteopathy (after)</td>
<td>7.781</td>
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<td>0.421</td>
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<tr>
<td>Desire to Learn More</td>
<td>9.6</td>
<td>0.7</td>
<td>0.5</td>
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<tr>
<td>Interest in Obstetrics (before)</td>
<td>7.844</td>
<td>2.682</td>
<td>0.67</td>
</tr>
<tr>
<td>Interest in Obstetrics (after)</td>
<td>9.844</td>
<td>0.352</td>
<td>0.088</td>
</tr>
<tr>
<td>Comfort with Obstetrics (before)</td>
<td>5.875</td>
<td>3.096</td>
<td>0.774</td>
</tr>
<tr>
<td>Comfort with Obstetrics (after)</td>
<td>8.656</td>
<td>1.972</td>
<td>0.493</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Difference</th>
<th>T Score</th>
<th>Standard Error</th>
<th>P (&lt;)</th>
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</thead>
<tbody>
<tr>
<td>Increase in Osteopathic Awareness</td>
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<td>0.68</td>
<td>0.0001</td>
</tr>
<tr>
<td>Increase in Obstetric Interest</td>
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<td>2.958</td>
<td>0.676</td>
<td>0.006</td>
</tr>
<tr>
<td>Increase in Obstetric Comfort</td>
<td>2.781</td>
<td>3.0308</td>
<td>0.918</td>
<td>0.005</td>
</tr>
</tbody>
</table>

### Conclusions:

From the participant’s feedback, it became clear that not only has the seed of interest in osteopathic management of obstetrics been planted in Ethiopia, even the small amount of demonstration that had been completed had increased awareness of osteopathy in this small cohort and increased comfort and interest in managing these patients. Given the difficulty of the material and the challenges of linguistic and cultural communication, the amount of time dedicated to each topic each day clearly limited how much information could be relayed. As detailed in their comments, the participants felt limited by their clinical responsibilities and the difficulty of time-management, and specifically felt that more time should be dedicated to the subject. Further investigations could address the limitations enumerated above by extending the timing and depth of the demonstration and by attempting to offer formal training that could then be assessed in ongoing prospective studies. This could be done by conducting at least three weeks of training for the hospital staff or for the new medical students. By offering formal training, and perhaps added incentives such books and other resources, the students and staff would be more dedicated to a longer schedule and the pace could be slowed to allow for adequate absorption of the information. Following a formal series of training, the opportunity would be ripe to conduct a prospective study that analyzes the outcomes of patients who receive OMM versus patients who receive Standard of Care treatment in the hospital. As medical students from US-based universities regularly rotate through the site, evaluation of treatments and data could be conducted over a continuous basis until sufficiently powerful data could be attained.
Background: Somatic and visceral dysfunctions have been shown to be able to be diagnosed through a variety of non-invasive palpatory techniques. Most of these techniques utilize the palpatory skills obtained during the first two years of an osteopathic medical student’s education. However, while the ability to identify and segmentally define somatic dysfunction throughout the body is taught at all U.S. Osteopathic medical schools, finding “the key lesion” is not widely taught. It is generally thought to require advanced palpatory skills usually acquired after years of practice. Edward G. Stiles, D.O., F.A.A.O. developed a protocol that enabled 1st year medical students to find the key lesion on a more gross somatic level consistent with their skill set.

Hypothesis: This pilot study was intended to determine the feasibility of a long term research study that would build upon this research, by assessing the prevalence and severity of somatic dysfunction, (by ICD-9 regions), and its relationship, if any between the chief complaint, & diagnosis of individuals between and amongst the 5 global health program sites of Touro University, California (TUCOM-CA).

Methods: First year College of Osteopathic Medicine students that were enrolled in the global health program during the summer of 2011 underwent a six hour training using a modified Stiles screening exam followed by a reliability assessment by Janet M. Burns, DO who has been trained by Dr. Stiles.

Results: Regions of severity do follow the paradigm of the arm and leg homunculus as described by Stiles. Furthermore, the non-somatic dysfunction does seem to coincide with the visceral somatic reflex.

Conclusions: This pilot study shows that first year trained Osteopathic medical students can obtain valid data after going through a protocol specific training regime utilizing the Stiles screening protocol. In developing countries where there is a lack of diagnostic equipment, medical supplies, and manual medicine training, there is a potential limitation in the ability to resolve chronic somatic dysfunction. Further research in the understanding of the relationship of chief complaint to physical findings is warranted for the future development of literature for patient education and treatment protocols by health care workers.
Comparison of OMM and TCM Tui-Na Diagnostic Methodology
Mickey Lui, OMS II\textsuperscript{1}, Yen-Chih Lin, OMS III\textsuperscript{1}, Bor-Han Chiu, OMS II\textsuperscript{1}, Karen Koto, OMS II\textsuperscript{1}, Yen-Yi Ho, CMD\textsuperscript{3}, Athena Lin, PhD\textsuperscript{1}, Janet Burns, DO\textsuperscript{2}
\textsuperscript{1}Global Health Program, Touro University-CA College of Osteopathic Medicine, Vallejo, CA,
\textsuperscript{2}Department of Osteopathic Manipulative Medicine, Touro University-CA College of Osteopathic Medicine, Vallejo, CA, USA
\textsuperscript{3}Taipei Hospital, Department of Health, Hsin-Chuang District, New Taipei City, 242-13, Taiwan (R.O.C.)

\textbf{Context:} The Tui-Na branch of traditional Chinese medicine (TCM) is a manipulative therapy similar to osteopathic manipulative medicine (OMM) in that both aim to improve the patient’s inherent healing abilities. Records of similar treatment modalities exist between OMM and Tui-Na, including soft tissue and articulatory techniques. Despite their similarities, currently there is limited research comparing and contrasting osteopathic and Tui-Na diagnostic methodologies.

\textbf{Hypothesis:} Given the analogous treatment modalities observed between OMM and Tui-Na, we hypothesized that the indications and diagnostic criteria for OMM and Tui-Na were also similar.

\textbf{Methods:} During the Global Health Program Summer Clerkship at Touro University California, we shadowed a TCM physician during 2 separate weeks at Taipei Hospital in Taiwan, Republic of China. A comparison of diagnostic findings in patients with chief complaints involving musculoskeletal problems was done before and after Tui-Na treatment. The TCM physician examined the patient using Tui-Na diagnostic methods before osteopathic students performed a screening examination developed by Edward G. Stiles, DO (Stiles sequencing). Findings were compared and discussed before Tui-Na treatment. Efficacy was assessed after treatment using both Tui-Na and Stiles Sequencing.

\textbf{Results:} We found that Tui-Na uses a wider variety of diagnostic and treatment methods than previously thought. The available literature regarding Tui-Na focused mainly on its use to restore Qi flow through acupuncture meridians as the main therapeutic endpoint. This study showed that within Tui-Na there are diagnostic protocols to OMM usage of TART findings to diagnose somatic dysfunction. Dr Ho demonstrated a form of Tui-Na that was strictly somatic in its diagnostic and therapeutic findings, focusing on assessing asymmetry, tissue hypertonicity, and myofascial strains around anatomic junctions using light contact. Many of the palpatory findings obtained using the Stiles sequencing closely correlated to those found using Tui-Na diagnosis methods.

\textbf{Conclusion:} Both osteopathic and Tui-Na forms of diagnosis, though different in their approaches, lead to similar palpatory findings. Treatments address the same somatic problems found by osteopathic physicians. Future research will be done comparing Tui-Na and OMM, which will enable both TCM practitioners and osteopathic physicians to incorporate complementary approaches to patient care.
Treatment of somatic dysfunction through the use of fascial continuity in TCM Tui-Na: Comparisons to OMM
Mickey Lui, OMS II, Yen-Chih Lin, OMS II, Bor-Han Chiu, OMS II, Karen Koto, OMS II; Yen-Yi Ho, CMD; Athena Lin, PhD; Janet Burns, DO
1. Touro University-CA College of Osteopathic Medicine, Vallejo, CA, USA, 2. Taipei Hospital, Department of Health, Hsin-Chuang District, New Taipei City, 242-13, Taiwan (R.O.C.), 3. Department of Osteopathic Manipulative Medicine, 4. Global Health Program

Context: Tui-Na, a form of manual medicine in Traditional Chinese Medicine (TCM) has similar diagnostic methodologies, treatments, and therapeutic end-points with Osteopathic Manipulative Medicine (OMM). Previous research, OMM and TCM: Comparisons of Manipulative Treatments described similarities between Tui-Na and OMM soft tissue and articulatory techniques. This research expands upon that research through collaborative video analysis of two separate long lever Tui-na techniques.

Methods: During the Touro University College of Osteopathic Medicine-CA (TUCOM-CA) Global Health Program Summer 2011 Clerkship at Taipei Hospital, Taiwan, R.O.C., osteopathic medical students (OMS-I) video recorded, with IRB approval, two separate Tui-Na treatments by a TCM physician, Dr. Ho. Patient consent was obtained, no identifying information was recorded and patient faces were censored for additional privacy. TUCOM-CA Osteopathic Manipulative Medicine faculty analyzed the video with the students, who provided English translation of commentary.

Results: Tui-Na has techniques that focus on the soma, utilizing fascial continuity for both diagnosis and treatment. The two Tui-Na treatments observed demonstrated long lever approaches that used:

a. Direct recoil via the upper extremity, with combined articulatory principles. Recoil is a principle utilized in OMM techniques including visceral manipulation.

b. Oscillatory vibrational force created by rhythmic dropping of the lower extremity (converting potential energy to kinetic), that travels along fascial continuity to target the dysfunctional tissue. The rhythmic nature of this technique is similar to Robert Fulford, DO’s use of the percussion hammer and Zachary Comeaux, DO’s use of manual oscillation in Facilitated Oscillatory Release.

Conclusion: These Tui-Na techniques were developed independently from OMM techniques, yet the similarities suggest common fundamental principles and therefore mechanisms of action underlying the therapeutic effectiveness of such methods. Providing ‘mechanisms of action’ of a therapy provides validation to the scientific and medical communities that outcome studies alone do not. This validation is needed to ensure reimbursement of OMM by third-party payers, in order to improve public access to OMM. The NCCAM (Complementary and Alternative Medicine) branch of the NIH is currently funding underlying mechanisms research. Collaboration between TCM and OMM could facilitate elucidating the mechanisms underlying the clinical efficacy of these techniques.
Comparison of Osteopathic Manipulative Medicine and Exercise on Blood Lactate Clearance
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Background: Lactic acid/lactate is a metabolic end-product of anaerobic glycolysis. Intramuscular accumulation of hydrogen ion associated with lactate production has been implicated in mechanisms causing muscle fatigue and recovery from high intensity exercise. Thus, understanding the factors that determine lactate accumulation and identifying interventions that delay buildup or facilitate clearance of lactate from blood and acid from muscles is physiologically important. Previous studies have shown that continuation of low intensity physical activity following a maximum intensity exercise bout (i.e. active recovery) significantly accelerates lactate clearance compared to sedentary rest (i.e. inactive recovery). Sustained muscle activity has been proposed to facilitate lactate clearance by maintaining increased blood flow to muscles and other lactate metabolizing organs such as the liver. However, other interventions based on this mechanism such as massage therapy have not been able replicate the same response. A strategy that has not been examined is Osteopathic Manipulative Treatment (OMT), which has been employed to increase local blood flow in lower limbs and to enhance lymphatic flow (Knott) for treatment of a variety of disorders. Therefore, the purpose of this study was to examine the effect of OMT on lactate clearance after high intensity cycling exercise.

Hypothesis: Post-exercise OMM therapy results in a more rapid time course of blood lactate clearance compared to inactive recovery and that is comparable to active recovery.

Methods: Subjects (male, n = 3) performed progressive resistance, maximum intensity stationary recumbent cycling exercise to promote lactate accumulation. Blood lactate was assayed from fingertip blood samples using a portable lactate meter (Lactate Plus®) at intervals during the exercise period and at 5-10 minute time points during the post-exercise period until values returned to pre-exercise baseline levels. The time course profile of lactate clearance was compared during (1) inactive recovery (sedentary rest while seated), (2) active recovery (20 min low intensity cycling), and (3) with OMT (20 minute treatment regimen).

Results: Compared to the lactate clearance time course during inactive recovery, peak lactate levels (11-17 mM/L) declined earlier and returned to baseline concentrations faster (60 min vs. 75 min) during the active recovery regimen.

Conclusions: Based on limited data, results are consistent with the findings of other studies utilizing a similar exercise regimen and blood lactate sampling protocol. The next phase of the study shall compare these data with the lactate clearance profile resulting from OMT. Results from this pilot study may lead to a better understanding of the mechanisms underlying lactate clearance, exercise recovery, and OMT methods.
PUBLIC HEALTH
Community-based Oral Health Promotion in North Vallejo: Exploration of Service Providers’ Perspectives

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Background: Vallejo, the site of two participating school based health centers (SBHCs), is in the most ethnically diverse county in California, with 36% White, 24% African American, 24% Asian, and 15% Hispanic. Patients at these SBHCs are predominantly minorities (89%) and uninsured (92%). Over a quarter of children in the United States ages 2-5 have tooth decay, with a majority of cases concentrated in minority children and those of low socioeconomic status (SES).

Objective: The purpose of this formative/process evaluation is to assist the Solano Coalition for Better Health Oral Health Services (SCBH-OHS) Project in identifying how the intervention can improve oral health education and services.

Methods: Community members, health service providers, and program staff, referred by the project leadership team, have been interviewed to assess current attitudes and barriers regarding oral health care education and services. Summaries of the reported findings and recommendations will be used to guide the intervention.

Results: Preliminary analysis identified key barriers to be: limited access to dental services accepting Medical and Partnership Health Plan insurances, transportation, oral health knowledge (proper brushing/flossing techniques, when to discontinue bottle feeding), lack of sufficient consultation time during appointments, and language limitations.

Conclusion: Recommendations by service providers to overcome these barriers included: 1) Increasing oral health knowledge, 2) Implementation of SCBH-OHS to increase access to oral health education and services, 3) Promotion of healthy nutrition and oral health in schools, 4) Training staff to perform dental varnishes, and 5) Organizing an annual meeting of representatives from Solano County dental health services to encourage community collaborations. Further assessments are required to inform the implementation of the SCBH-OHS, to the evolving needs of the Solano community.
The Power of Marketing: Snus tobacco as a Swedish Heritage Product
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Background: Snus, a moist smokeless tobacco product, is identified as traditionally Swedish. RJ Reynolds and Philip Morris are selling snus products in the US, highlighting the product's Swedish roots in their marketing materials. We sought to understand whether the association of snus with Swedish tradition is perception or reality.

Methods: We analyzed previously secret tobacco industry documents, Swedish newspaper archives and the scientific literature.

Results: Swedish snus was introduced in the mid 17th century. Use peaked in Sweden in the early 20th century and declined sharply. Use was low until the 1960s when the state-owned tobacco monopoly (AB Svenska Tobaksmonopolet) targeted young professionals. The marketing was immediately successful; the median age of snus users dropped from 41 in 1969-70 to 30 in 1972-73. This marketing effort joined snus to Swedish identity so strongly that many Swedes were willing to forgo membership in the European Union (EU), which banned snus in 1992. When Sweden joined the EU in 1993, an exception based on cultural heritage allowed for the continued sales and use of snus in Sweden. Swedish Match and Philip Morris have agreed to jointly sell snus internationally and are increasing pressure to reverse the EU ban on the product.

Conclusions: Snus saw a renaissance in Sweden due to a marketing campaign that altered its image. The association of snus with Swedish heritage is positive for tobacco companies in Sweden and other countries. This is a concern for tobacco control as snus is increasingly marketed internationally as an alternative to cigarettes.
Exposure to DEHP and its Implications in the Pediatric Population of Taiwan
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Background: In a world full of synthesized food additives, we often wonder if the foods we eat right now are indeed safe. Moreover, even food repeatedly tested by the FDA can still contain dangerous substances not detected by routine procedures. In May 2011, the Taiwanese government accidentally discovered a manufacturing firm that specialized in clouding agent, a usually harmless chemical emulsifier that enhances the consistency and color of juice products, was using a plasticizer Bis(2-ethylhexyl) phthalate (DEHP) to substitute for more expensive natural clouding agents. The potential DEHP toxicities include kidney toxicity, thyroid problems, infertility, cancer, precocious puberty in females, and retarded sexual development and feminization in males. The tainted clouding agent was widely distributed in many food and medicinal products, including juice concentrate, sports drinks, and even some medical supplements/drugs. The relatively vast exposure to these products, combined with DEHP's potential effect on sexual development in children, caused unprecedented panic in the Taiwanese public. Overnight, pediatric clinics were flooded with concerned parents to get their children tested for possible DEHP exposure.

Hypothesis: The goal of this study is to test the hypothesis that DEHP exposure on pediatric patients may lead to reproductive changes. We also hypothesize that such a study will help ease the public concern about the incident, as well as raise awareness to future food contamination problems, and to establish an early detection mechanism in preparation for future crisis.

Materials and Methods: While participating in the Touro University Global Health Program, we shadowed pediatricians at Taipei Hospital that services pediatric patients concerned with plasticizer-tainted food products ill health effects. Using reports of which products were found to be contaminated, a survey was created to access patient exposure through various sources and duration since birth. The survey was made to capture information regarding diagnosis related to heightened allergic responses and gonadotropic changes. Blood samples were collected and analyzed for gonadotropic hormones. Additionally, urine samples were collected for future testing of indicators of DEHP exposure.

Results: Sixty-nine children between the ages of 1 and 13 years were included in our sample population. Survey results and lab results were analyzed. Initial review of the data shows no significant difference in CBC results, hormonal levels or gonadotropic changes. Further review of the data to look for possible connections between exposure and lab data is ongoing.

Conclusion: Further analysis is needed to investigate the possible consequences of ingestion of DEHP. Age specific gonadotropic hormones levels should be considered. Comprehensive lab data and survey result comparison will be examined and discussed.
Food Stamps and Increased Obesity in the Current Economy
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Background: Obesity (BMI > 30) is rapidly becoming one of the most pressing chronic health problems. Recent studies have linked SNAP (Supplemental Nutrition Assistant Program) colloquially known as “Food Stamps,” with increased BMI among its participants. Currently, SNAP participants receive one initial session relating to nutrition. With the economy doing poorly, increased numbers are participating in SNAP. This study examines the potential of SNAP recipients to maximize caloric intake and the minimum cost of a balanced and nutritious diet.

Methodology: Qualified foodstuffs which maximize calories per dollar have been priced at three national chain stores over a 2 week period in January and February 2011. Maximum caloric diet for the $200 average CA household supplement was calculated for each chain store and an average of all stores.

Results: With a caloric intake of 90,000 per month representing the diet resulting in obesity (3000 calories per day – average recommended caloric intake is approximately 2,000 calories per day per adult in the US), a total of approximately 700,000 calories per month can be purchased and consumed at a cost of $200. A balanced and nutritious diet can be purchased and consumed at less than average monthly SNAP household grant.

Conclusion: A lack of proper nutrition information or an inadequate educational session for new participants of SNAP is evident and a more effective educational component is recommended. New SNAP participants become more obese with Food Stamps implying that participants are continuing their current unhealthy eating habits and/or increasing their consumption of foods with a high dietary energy density. Food deserts can be contributing to an inability of SNAP participants to access needed healthy foodstuffs. The SNAP program appears to have unintended consequences as a contributor to a growing nationwide health problem.