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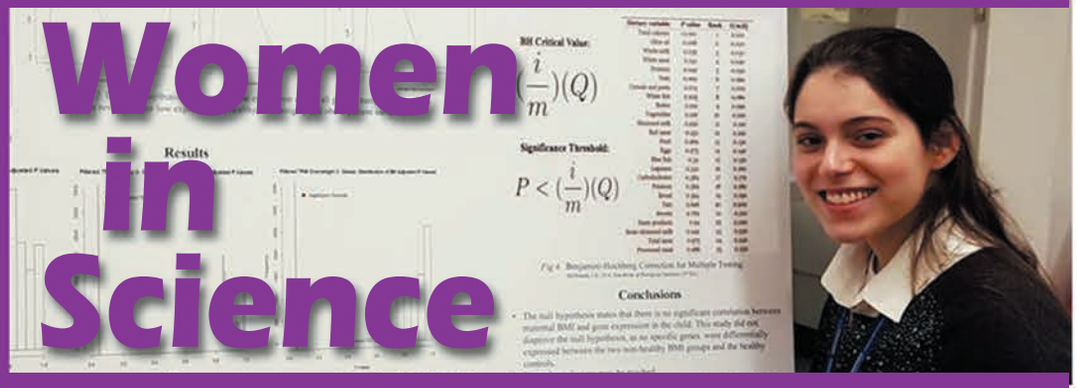
Women in Science | Yeshiva University STERN COLLEGE FOR WOMEN | Volume XII

Women in Science



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STERN COLLEGE FOR WOMEN

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Student Co-editors

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Introductory Remarks

The Departments of Biology, Chemistry/Biochemistry, Physics, Psychology, and Speech Pathology/Audiology each unique in its specific discipline, share a proactive approach in promoting the academic success of students at Stern College for Women (SCW) and in helping them achieve their career goals. The spectrum of career choices in the biomedical, health, natural sciences, physical sciences, and behavioral sciences is varied, with our students entering graduate programs in medicine, dentistry, osteopathy, optometry, veterinary science, psychology, physical therapy, occupational therapy, physician assistant, nursing, genetic counseling, pharmacy, nutrition, speech pathology/audiology, education, social work, and law; masters programs in biotechnology, public health, engineering, architecture, and bioinformatics; and doctoral programs in the biomedical sciences, chemistry, physics, neuropsychology, clinical psychology, and school psychology. Education in biology, chemistry, physics and engineering sciences are stepping stones toward careers in research and education in technology-oriented fields, including nanoscience and nanotechnology.

The Departments of Biology, Chemistry and Biochemistry, Physics, Psychology, and Speech Pathology/Audiology direct students to stretch beyond the classroom experience by involvement in scientific research. Both in the academic year and in the summer, students may work one-on-one with on-campus faculty. In the Summer, 2011, a collaborative interaction between Bar Ilan University and Yeshiva University enabled SCW and Yeshiva College (YC) undergraduates to intern in research laboratories in Bar Ilan University and, thereby, to spend a summer in Israel. In the summer 2016, 15 SCW undergraduates participated in this summer laboratory experience, now termed the Bar Ilan Summer Program. The science faculties actively encourage the science majors to apply for competitive undergraduate research internships, locally, nationally, and internationally. In the summer of 2016, approximately 60 SCW students were involved in research at SCW, The Rockefeller University, Albert Einstein College of Medicine (AECOM), Montefiore Medical Center, Sloan-Kettering Cancer Center, Mt. Sinai School of Medicine, NYU Medical Center, NYU Langone Multiple Sclerosis Comprehensive Care Center, Rutgers University, Columbia University Medical Center, Health Careers Opportunity Program at the Rusk Institute for Rehabilitative Medicine, Lady Davis Institute (Montreal), Sick Kids Hospital (Toronto), and Tel Aviv Sourasky Center (Israel).

The Jewish Foundation for the Education of Women (JFEW) Science Fellowship Program was inaugurated in the 2009-2010 academic year, with ten participating students. Each subsequent year, an additional nine to ten students, all with interests in the sciences, joined the program. Most recently, the Foundation has renewed a grant to support additional cohorts through the 2017 academic year. Highlights of the JFEW Science Fellowship Program include a partial scholarship, a stipend for a summer research internship as

well as travel funds, a stipend to support scientific conference attendance, one-on-one mentoring with a science faculty member, and an enrichment program, providing workshops to aid students in their academic and professional development. This year, the JFEW Fellows have obtained internships, either in clinical or biomedical wet-lab research, in fields of research including psychology, cancer cell biology, veterinary medicine, neurobiology, and molecular biology. The Fellows have interned in prestigious institutions, including University of Chicago, Emory University, AECOM, The Rockefeller University, Johns Hopkins University, Harvard Medical School, Rutgers University, New York University, and Yale University, Barrow Neurological Institute, Hadassah Hospital, Bar Ilan University, Tel Aviv University, and in industry, Citromax. Several of the JFEW students have taken leadership roles in forming and/or leading the Neurobiology Club, the Genetics Club, the Optometry Club, and the Medical Ethics Society. Graduates of the Program are pursuing careers in various science and health-related fields: medicine, dentistry, physical therapy, occupational therapy, nursing, public health, biomedical engineering, math education, food science, psychology, and veterinary medicine.

The Department of Psychology offers an Honor's Research Seminar for upper-level psychology majors. As part of this seminar, students are involved in ongoing research projects, either at SCW or at off-campus sites, such as NYU Medical Center and Mt. Sinai School of Medicine, and are supervised by an on-site investigator for 8 hours/week for 12 weeks. The primary requirement for the course is a comprehensive literature review and/or scientific report of the students' research projects, as well as a class presentation. The combination of internship and seminar allows the students to gain practical experience in literature review, data collection and management, and scientific writing and oral presentations. Students attending graduate programs in Clinical Psychology have identified the research seminar as being particularly helpful in preparing them for graduate school. In the spring semester, Naomi Wakschlag in conjunction with Dr. Terry DiLorenzo, presented the poster, "The association between modest dress and body image in Orthodox Jewish women," at the annual meeting of the Society of Behavioral Medicine, Washington, D.C.

To meet growing student interest in the neurosciences, programs in neurobiology were instituted by a collaborative interaction between the Department of Psychology and the Department of Biology. In these programs, students complete a prescribed combination of courses in biology and in psychology (with each Department emphasizing its own requirements) and upon successful completion of the program, the designation "concentration in the neurosciences" is included on the college transcript.

Students engaged in behavioral research in Psychology, Biology, or Neuroscience are encouraged to present at the Annual Behavioral Sciences Student Research Conference held at the Ferkauf Graduate School of

Psychology of Yeshiva University. The conference serves as a valuable opportunity for undergraduates to discuss their research in an academic setting and to meet other undergraduate and graduate students and faculty involved in research.

The Speech Pathology/Audiology Department provides the academic and pre-clinical experiences to begin graduate studies, either for an M.S. in speech pathology or a Ph.D. in audiology. As part of the "extra-curricular" activities of the Department, students edit, manage and publish a journal, reflecting either a unique research project or a literature review. The topics include speech language pathology, audiology, or speech and hearing science. Some students participated in a research project involving dysphagia and dysphonia associated with anterior cervical spine surgery. These students were part of a project conducted at the North Shore Hospital, reviewing patient data and research materials. The Speech Pathology/Audiology Club hosted renowned professionals to address clinical experiences, research projects, and career issues.

A specific objective of the science departments at SCW, in addition to nurturing the highest level of academic achievement, is to provide students with opportunities for leadership roles. Upper-level students may be appointed to positions as Teaching Assistants (TAs) for laboratory sections and as Recitation Instructors to review materials for the lecture sections of the science courses. Student-led clubs, such as the Biology Club, the Chemistry Club, the Physics Club, the Psychology Club, the PreMed Club, the PreDent Club, the Occupational Therapy Club, the Pharmacology Club, the Nutrition Club, the Global Health Club, Pre-Engineering Club, the Nutrition Club, the Bikur Cholim Club, *etc*., provide opportunities for students to gain skills in organizing events and in coordinating social functions. The 2010-2011 academic year saw the birth of four new clubs, the Nursing Club, the Genetics Club, the Optometry Club, and the Neuroscience Club. The Public Health Club was launched during the 2011-2012 academic year; beginning in the fall semester 2016, the college instituted a minor of public health. Our newest club, the Physician Assistant Club, was started in the 2012-2013 academic year in order to spur interest in an increasingly popular field. These clubs often invite outside speakers to lecture and to conduct question-and-answer sessions on a variety of interesting topics. The Nursing Club held a number of particularly well-attended events, including an information session with admissions officers from the nursing programs at NYU, Columbia University, and Pace University. It also organized a guided tour of the NYU College of Nursing. These student-run clubs provide students with the opportunity to develop the social and professional skills needed to succeed in their future careers and provide networking opportunities with Stern College alumni already in the field.

SURGE, the Student Undergraduate Research Group Exchange, is a faculty-sponsored, student-led club that gives students the forum to present their research as a seminar before their colleagues and the science faculty. The

goals of this faculty-initiated club are to encourage and foster research and the exchange of research information. Meetings are held once a month, usually with two or three students presenting PowerPoint professional seminars. Faculty members also use these meetings to inform students of upcoming internships and fellowship opportunities. In the 2015-2016 academic year, the following students presented seminars:

	2015 FALL SURGE Meetings	
October 2015		
Name	**Research Title**	**Program/Location**
Merav Gold	Using CRISPR CAS-9 to Modify HEK 293 Cells	Bar Ilan University
Batsheva Reich	Effects of Nek1 Knockout on Primary Cilia	Bar Ilan University
Michal Auerbach	Synthesis of an Ideal 3-Aminopropyl Triethyoxysilane Surface for DNA Adsorption and Desorption	Stonybrook University
November 2015		
Name	**Research Title**	**Program/Location**
Emily (Aliza) Chase	Difference in Gene Expression in Parental and Transformed Epithelial Cells	Bar Ilan University
Ahava Muskat	The Effect of PRMT5-MEP50 on Lung Cancer Cells	Bar Ilan University
Rina Leah Davidson	Glutamate Modulator Riluzole Reverses the Gene Expression Profiles of Aging and Alzheimer's Disease in the Hippocampus	The Rockefeller University
December 2015		
Name	**Research Title**	**Program/Location**
Michelle Kohansieh	Implications of Gender Differences in Coronary Calcification as Assessed by CT Coronary Angiography	North Shore-Long Island Jewish
Miriam Klahr	Investigating the Link Between Variability in Gene Expression and Protein Abundance in Ovarian Cancer Patients	Albert Einstein College of Medicine (SERC)

	2016 SPRING SURGE Meetings	
February 2016		
Name	**Title**	**Program/Location**
Esther Kazlow	Expression Quantitative Trait Loci in Immune Pathways and Their Effect on Cutaneous Melanoma Prognosis	New York University
Nechama Lipton	Identifying Morphokinetic Parameters Associated with Embryo Quality	CReATe Fertility Centre
Elizabeth Bitterman	The Influence of L-lactate on Neurogenesis	Bar Ilan University
April 2016		
Name	**Title**	**Program/Location**
Odeya Barayev	Pax8 Transcription Factor and the Epithelial Mesenchymal Transition in Ovarian Carcinomas	Dana Farber Cancer Center
Dafna Meyers	Understanding Impaired Lipid Absorption in Germ Free Mice	University of Chicago
Sara Leora Wiener	The Effects of Resveratrol and Rapamycin on TSC Null Diseases	SCW, Biology Dept

Each Fall semester, the science departments jointly sponsor a poster presentation contest. Students present their work and discuss the research with attending faculty. The posters, and more importantly the student's understanding of the project and the extent of her hands-on participation, are evaluated by the science faculty. Winners are selected to present at a national meeting of the American Chemical Society. The costs of attending the meeting, including transportation and hotel, are underwritten by the Dean's Office, SCW, and by faculty research grants. In the Spring semester of 2016, Adi Berman (poster title**,** "Raptor mediated mTORC1 phosphorylation of ER in breast cancer") and Sara Leora Wiener (poster title, "The combined effects of resveratrol and rapamycin in TSC null diseases") presented at the 251st National Meeting of the American Chemical Society (ACS), San Diego, CA. Dafna Meyers, representing JFEW also attended the ACS meeting and presented her research (poster title, "Understanding impaired lipid absorption in germ free mice"). At the ACS meeting, the SCW Chemistry Club received the Commendable Chapter Award, as well as full funding for its Community Interaction Grant.

SCW graduates attending AECOM for their medical education are eligible to apply for Anne Scheiber Fellowships. This unique award provides up to full tuition scholarships based on need for four years of medical training (see "Anne Scheiber Fellowship").

Students considering careers in the various allied health fields (for example, occupational and physical therapy) or in engineering may wish to consider one of our several combined degree programs with other universities. In the spring term of 2009, Yeshiva University entered into a cooperative agreement with the NYU Steinhardt School of Culture, Education, and Human Development, designed to expand opportunities for students to prepare for a career in teaching math and science at the elementary and high school levels. During the fall of 2012, Stern College signed an articulation agreement to implement a combined program with the NYU College of Nursing. Students interested in this program pursue a shaped major that leads to the completion of the necessary prerequisites within five semesters for those who study for a year abroad in Israel (or seven semesters for those who come directly to Stern College after high school). If they are accepted to the program, they will receive a B.A. from Stern College upon completion of their first semester at the NYU College of Nursing. Once they have successfully completed the 15-month accelerated program at NYU, they will be awarded a BSN from their nursing school. This exciting new program has already admitted two classes of SCW students and should be the basis of a productive and long-term partnership between Stern College and the NYU College of Nursing" (see "Combined Programs"). The largest class yet, with 16 admitted students, entered NYU via the joint program in January, 2016.For students interested in nutrition, a shaped major option exists. Students in their senior year may take up to 12 credits in approved nutrition courses at NYU towards their shaped major. These courses will also count toward the DPD sequence requirements at NYU should the student continue in that program after completing her BA degree.

An important focus of SCW is to educate the next generation of Jewish women for leadership positions in their professions and communities. Our commitment to the YU mission of *Torah U'Madda* is mirrored in the daily lifestyles of our students and thereafter in their future roles as professionals. Stern College students have academic strengths in both general and Jewish studies; the fusion of these worlds is evident in the student publication, *Derech HaTeva, a Journal of Torah and Science.* This SCW publication is distributed nationally and internationally and has received much praise for its level of Torah/science scholarship (see "*Derech HaTeva,*" for a listing of articles that appeared in volumes 1 through 20). In the 2015-2016 academic year, the *Torah U'Madda* presentations included talks by Rabbi Yosef Bitton ("Awesome creation"), Rabbi Gideon Weitzman, ("HPV and immunizations") and Dr. David Kulak ("Reproductive medicine: replacement of mitochondrial DNA").

Specific faculty members are assigned roles to provide an intensive involvement in guiding students with their career choices and specifically in assisting with the application process. Dr. Brenda Loewy, director of the Office of PreHealth Advisement, has recently been joined by Dr. Chaya Rapp, to assist those students interested in careers in medicine, dentistry, optometry, veterinary medicine, and pharmacy. Mr. Jeff Mollin's focus is those students interested in careers in physical therapy, occupational therapy, physician assistant, and nursing and Dr. Harvey Babich assists those interesting in a career in genetic counseling.

In the Fall semester, 2012, SCW alumni, now medical students in AECOM, initiated The Stern-Einstein Mentorship Program (affectionately known as the "Big Sister Mentor Program"). The intent of this program was to connect pre-med or pre-health undergraduates with SCW alumni at AECOM, who will guide the undergraduates in the medical school application and interview processes, as well to be available to answer simple questions that will save time and prevent unnecessary frustration. This program is now beginning its third year and has met with much success.

Dr. Loewy organized several seminars in which guest speakers provided valuable insights into various professions, as well as information on the admissions process to their graduate and professional programs. This past year, the SCW and Yeshiva College (YC) pre-med clubs organized the annual Medical School Fair which admission directors and officers from allopathic and osteopathic medical schools, as well as from American medical student programs in Israel, attended. The location of the annual fair is alternated between the Wilf Campus (YC) and Beren Campus (SCW); this year it was held at the Wilf Campus. Each medical school had its own booth, thereby allowing students to approach the representative and to ask questions and gain insight into the school. The following schools were present at the fair: representing the American Allopathic Medical Schools were Hofstra, Cornell, Quinnipiac, and Jefferson the Commonwealth Medical College; representing the American Osteopathic Medical Schools were Philadelphia College of Osteopathic Medicine and Rowan University School of Osteopathic Medicine; representing the Israel American Medical Student Programs were Sackler, Technion, and Ben Gurion. Also in attendance were Touro College of Pharmacy and New York College of Podiatric Medicine.

In the 2011-2012 academic year, Dean Karen Bacon initiated the "Deans' Scholars Academic Enrichment Program." This Program offers those outstanding students in Yeshiva University's undergraduate schools an opportunity to participate in one of three cooperative programs. The program of particular interest to science majors is "Frontiers in Biomedical Science." This project is under the direction of Dean Victoria Freedman, Associate Dean for Graduate Programs, Graduate Division of Biomedical Sciences, at the Albert Einstein College of Medicine. The seminar meets six Fridays during the Spring semester at AECOM and features leading biomedical scientists and their research.

Department of Biology

Faculty: Anya Alayev, Ph.D.; Levy Amar, Ph.D.; Harvey Babich, Ph.D.; Bill Bassman, M.S.; Marina Holz, Ph.D., Brenda Loewy, Ph.D.; Amanda Mitchell, Ph.D., Jeffrey Mollin, M.Phil.; James Nussbaum, Ph.D.; Victoria Ruiz, Ph.D.; Alyssa Schuck, Ph.D.; Monica Smiddy, M.D.; Margarita Vigodner, Ph.D.; Richard Weiss, M.D.

The Department of Biology offers a wide range of courses providing students with a thorough grounding in the fundamentals of modern biology, as well as exposing them to the cutting-edge areas of biomedical research. Course offerings include Cell Biology, Genetics, Human Anatomy, Human Biology, Human Development, Human Physiology, Immunology, Kinesiology, Medical Biochemistry, Microbiology, Molecular Biology, Neurobiology, Nutrition, Pharmacology, and Reproductive Biology.

The B.A. in biology offered by the Biology Department requires completion of Principles of Biology I and II and 20 credits of advanced courses in Biology, of which four of the courses must be 4-credit lecture/laboratory courses. Also offered by the Biology Department are rigorous programs focusing on a concentration in neurosciences and a concentration in cell and molecular biology. Upon completion of the appropriate course of study, the phrase “concentration in the neurosciences” or “concentration in cell and molecular biology” is noted on the transcript. To accommodate the science requirements for non-science majors, the 4-credit course, Human Biology, lecture with laboratory, was introduced.

Exciting one credit **Journal Club** courses are offered. “Oncology,” the topic of the Journal Club course offered in the Fall term, 2016, is taught by the SCW graduates, Rikah Lerer and Miriam Steinberger, now in the Albert Einstein College of Medicine (AECOM). In the Spring semester, 2015, the topic of this Journal Club was “Immunology and Disease” and was taught by Hadassa Klerman, Jennifer Deluty, and Elisa Karp. In the Fall semester, 2015, Dr. James Nussbaum, Ph.D., P.T., instructed the Journal Club course entitled, “Human Gait.” This Journal Club was directed to pre-PT and pre-OT students; in the Fall semester, 2014, Dr. Nussbaum taught the Journal Club course, “Biomechanics.”

Dr. Brenda Loewy, a faculty member of the Biology Department and the recipient of the 2008, Dean Karen Bacon Award for a Senior Faculty Member, is the college’s Pre-Health Advisor. Her directive is to guide students interested in medicine, dentistry, optometry, and podiatry through the application process. To accomplish these goals, Dr. Loewy organizes a series of wide-ranging seminars. The overwhelming number of students interested in medicine, dentistry, and optometry, necessitated the recruiting of Dr. Chaya Rapp, Department of Chemistry and Biochemistry, to join the **Office of Pre-Health Advisement**. An important addition to the pre-health advisement staff was the appointment of Mr. Jeffrey Mollin, a member of the

Biology Department, who guides students with career goals in nursing, physical therapy, occupational therapy, and physician assistant. Dr. Harvey Babich guides those undergraduates interested in a career as a genetic counselor. Dr. Alyssa Schuck, faculty member of the Biology Department, heads the **Jewish Foundation for Education of Women** (JFEW) Science Fellowship and guides students participating in this program. Dr. Schuck was selected as the Senior Class Professor of the Year, 2013, 2014, and 2016. In 2016, Dr. Schuck also received the Dean Karen Bacon Faculty Award.

In the 2015-2016 academic year the Biology Department hosted a series of ***Torah U'Madda*** presentations, including talks by Rabbi Yosef Bitton, "Awesome creation." Rabbi Gideon Weitzman (PUAH Institute), "HPV and immunizations" and by Dr. David Kulak, an IVF physician, "Reproductive medicine: replacement of mitochondrial DNA." In the 2014-2015 academic year Dr. Itsik Pe'er, Ph.D., spoke on "The sequence of the Ashkenazi genome," and Yael Kramer, M.S., spoke on "Research in fertility interventions: forging a path from bench to baby."

Rabbi Dr. Richard Weiss presented the following ***Torah U'Madda*** seminars: (a) Responsibility for Health Care: Personal vs. Communal; April 5, 2016; CareOne Healthcare Facility, Teaneck, NJ; (b) Contraception and Fertility (2 part lecture); March 30 and May 18, 2016; Lander College for Men, Queens, NY; and (c) End of Life Issues; May 18, 2016; Rabbi Isaac Elchanan Theological Seminary (RIETS) for the practical *halacha* program of the '*semicha*' program.

Dr. Marina Holz, a Professor of Biology, and Dr. Margarita Vigodner, an Associate Professor of Biology, have sky-rocketed the Biology Department to new heights, as attested by their record of **publishing scientific research manuscripts** in prestigious scientific journals and by their receipt of significant external funding. Both professors hold secondary appointments at the rank of Assistant Professor in the Developmental and Molecular Biology Department (Dr. Vigodner) and in the Department of Molecular Pharmacology (Dr. Holz) at AECOM. In 2012, Dr. Holz was awarded the Point of Light Award at the Yeshiva University Hanukkah Convocation, in 2013 received the LAM Foundation Pilot Award, in 2015 received the American Society for Biochemistry and Molecular Biology (ASBMB) Undergraduate Faculty Travel Award and the Platform Presentation Award from the Lymphangioleiomyomatosis (LAM) Foundation (travel award), and in 2016 received the ASBMB Undergraduate Faculty Award.

Dr. Vigodner's past **research support** included the NIH, NICHD: Academic Research Enhancement Award 1R15HD067944-01A1; "Regulation of Spermatogenesis by sumoylation;" extended until 1/11/2015 as an NIH; NICHD Administrative Supplements to Recover Losses Due to Hurricane Sandy. Through support by the Mitrani Foundation, in the Summer, 2015,

the Vigodner laboratory was fully renovated. In addition, the Mitrani Foundation provided a small grant to support student research.

Dr. Holz's current **research support** includes: (a) American Association for Cancer Research-Bayer Innovator and Discovery Award: project title, "ERRa as a marker in TNBC;" (b) Mindlin Foundation: project title: "Combination of rapamycin and resveratrol for treatment of bladder cancer;" (c) American Cancer Society: project title, "mTOR signaling pathway in cancer;" (d) National Institutes of Health: project title, "Identification and characterization of S6K1 targets in mammary cell proliferation;" and (e) Atol charitable trust: project title, "The role of S6K1 in breast cancer."

Dr. Schuck, whose research interests involve the response of human oral cancer cells to nutraceuticals, as well as Drs. Vigodner and Holz, actively recruit SCW undergraduates to join their research. The focus on cutting-edge research by the Biology faculty has been the driving force in the publication of numerous manuscripts in peer-reviewed scientific journals.

Below is a list only of faculty-generated manuscripts with a publication date of 2014 and later.

Cuesta, R., and Holz, M.K., 2016, RSK-mediated down-regulation of PDCD4 is required for the proliferation, survival, and migration in a model of triple-negative breast cancer. *Oncotarget* 7:27567-27583.

Manna, S., Bostner, J., Sun, Y., Miller, L.D., Alayev, A., Schwarz, N.S., Lager, E., Fornander, T., Nordenskjöld, B., Yu, J.J., Stål, O., and Holz, M.K., 2016, ERRa is a marker of tamoxifen response and survival in triple-negative breast cancer. *Clin. Cancer Res.* 22: 1421-1431.

Klionsky, D.J. *et al.* (numerous coauthors, including M.K. Holz), 2016, Guidelines for the Use and Interpretation of Assays for Monitoring Autophagy, 3rd ed., *Autophagy* 12:1-222.

Manna, S., and Holz, M.K., 2016, Tamoxifen action in ER-negative breast cancer. *Sign. Transd. Insights*, 5: 1-7

Xiao, Y., Pollack, D., Andrusier, M., Levy, A., Callaway, M., Nieves, E., and Vigodner M., 2016, Identification of cell specific targets of sumoylation during mouse spermatogenesis *Reproduction*, 151:149-166.

Alayev, A., Salamon, R.S., Berger, S.M., Schwartz, N.S., Cuesta, R., **S**nyder, R.B., and Holz, M.K., 2015, mTORC1 directly phosphorylates and activates ERα upon estrogen stimulation. *Oncogene* 35:3535-3543.

Xiao, Y., Pollack, D., Nieves, E., Winchell, A., Callaway, M., and Vigodner M., 2015, Can your protein be sumoylated? A quick summary and important tips to study SUMO-modified proteins. *Anal Biochem.* 477:95-97.

Alayev, A., Berger, S.M., and Holz, M.K., 2015, Resveratrol as a novel treatment for diseases with mTOR pathway hyperactivation, *Ann. N.Y. Acad. Sci.* 1348:116-123.

Alayev, A., Salamon, R.S., Sun, Y., Schwartz, N.S., Yu, J.J., and Holz, M.K., 2015, Effects of combining rapamycin and resveratrol on apoptosis and growth of TSC2-deficient xenograft tumors, *Am. J. Respir. Cell Mol. Biol*. 53:637–646.

Pollack, D., Xiao, Y., Shrivastava, V., Levy, A., Andrusier, M., D'Armiento, J.M., Holz M.K., and Vigodner M., 2015, CDK14 expression is down-regulated by cigarette smoke *in vivo* and *in vitro*. *Toxicol. Lett*. 234:120-130.

Alayev, A., Berger, S.M., Kramer, M.Y., Schwartz, N.S., and Holz, M.K., 2015, The combination of rapamycin and resveratrol blocks autophagy and induces apoptosis in breast cancer cells. *J. Cell. Biochem.* 116:450-457.

Alayev, A., Doubleday, P.F., Berger, S.M., Ballif, B.A., and Holz, M.K., 2014, Phosphoproteomics reveals resveratrol-dependent inhibition of Akt/mTORC1/S6K1 signaling. *J. Proteome Res*., 13:5734-5742.

Alayev, A., Sun, Y., Snyder, R.B., Berger, S.M., Yu, J.J., and Holz, M.K., 2014, Resveratrol prevents rapamycin-induced upregulation of autophagy and selectively induces apoptosis in TSC2-deficient cells. *Cell Cycle*, 3:371-382.

Shrivastava, V., Marmor, H., Chernyak, S., Goldstein, M., Feliciano, M., and Vigodner, M., 2014, Cigarette smoke affects posttranslational modifications and inhibits capacitation-induced changes in human sperm proteins, *Reprod. Toxicol*. 43:125-129.

Drs. Holz and Vigodner presented their research at meetings of national and international societies. Below are some of these presentations.

Vigodner, M. Cross-talk between sumoylation and phosphorylation." at Columbia University (April 27, 2016) and at AECOM (May 16, 2016).

Holz, M. Estrogen induces RAD51C expression and localization to sites of DNA damage (April 4, 2016, ASBMB annual meeting)

Holz, M**.** Targeting mTOR signaling in TSC/LAM (Nov 2, 2015, Pulmonary Ground Rounds, University of Cincinnati).
Holz, M.K., 2015, Lymphangioleiomyomatosis International Research Conference, Chicago, IL

Holz, M.K., 2015, 3rd International Meeting on Resveratrol, University of Hawaii, Hilo, HI

Holz, M.K., 2015, ASBMB annual meeting. Boston MA (undergraduate faculty travel award for Holz)

Holz, M.K., 2015, Targeting PI3K/mTOR in cancer, AACR meeting, Philadelphia, PA

Undergraduates majoring in biology have achieved national recognition.

Rina Leah Davidson: Columbia University's Amgen Scholars Program, summer research (2016)

Sima Grossman: American Society for Biochemistry and Molecular Biology (ASBMB) Honors Society (2016)

Sara Leora Wiener: Mindlin Foundation Award (2015)

Jennifer (Sima) Grossman: Kressel Fellowship (2015)

Kayla Applebaum: ASBMB Undergraduate Student Travel Award. Kayla was named a 2014 Goldwater Scholar (2015)

Off-campus research placements abound, with SCW students obtaining **research internships** during the 2015-2016 academic year at The Rockefeller University, Mount Sinai School of Medicine, New York University Medical Center, and Columbia University. Summers are a prime time for research. In the Summer, 2016, our students have participated in the Bar Ilan University summer research program, as well as in interning in the Albert Einstein College of Medicine, The Rockefeller University, Mt. Sinai School of Medicine, Columbia University, New York University Medical Center, Sloan-Kettering; Rusk Institute for Rehabilitative Medicine; Rutgers University, College of Staten Island; Sure-Tox Laboratory; University of Texas MD Anderson Cancer Center; Sick Kids Hospital, and Toronto; Tel Aviv Sourasky Center. Rina Leah Davidson was a recipient of a prestigious: internship with the Columbia University's Amgen Scholars Program.

The Department of Biology has upgraded the infrastructure of the on-campus research laboratories. Beginning in the Summer, 2011, and extending into the Fall semester, the on-campus research laboratory (room 341 of 253 Lexington Avenue) of Dr. Holz was renovated and modernized through a $100,000 grant from the Elias, Genevieve, and Georgiana Atol Charitable Trust. Dr. Holz specializes in cancer research. This expansion and upgrading of the Holz laboratory accounted, in part, for her successes in securing prestigious grants and in attracting many undergraduate interns. In the Summer, 2014 and continuing into the Fall, 2014, through a grant of $200,000 from the Selma T. and Jacque Mitrani Foundation, renovations and modernization of the on-campus male infertility research laboratory of Dr. Vigodner (room 347of 253 Lexington Avenue) commenced. Such

renovations and modernizations will allow Dr. Vigodner to upgrade her research operation to further provide opportunities for undergraduate research and to further increase her effectiveness in procuring external funding.

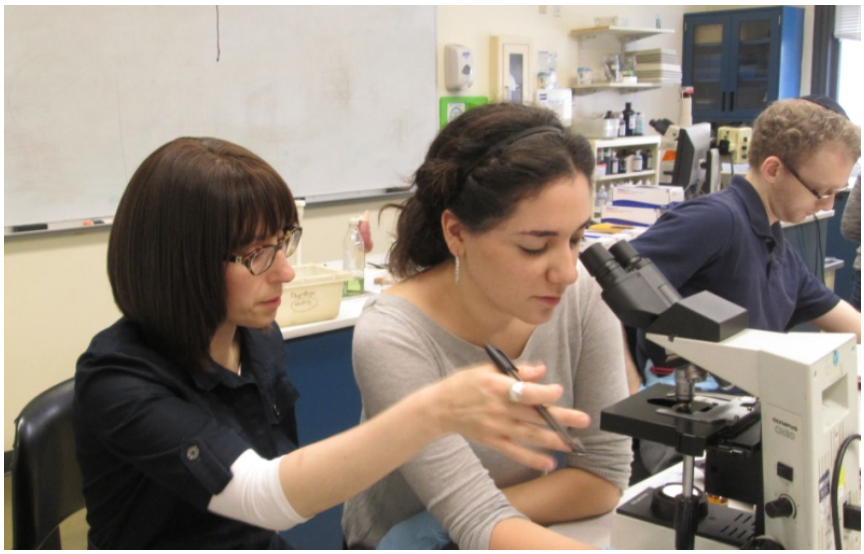
To maintain state-of-the-art scientific technology, the Department of Biology constantly upgrades the equipment used in the teaching laboratories and in the on-campus research laboratories. During the 2013-2014 academic year the following items were purchased, through funding obtained by Dr. Holz: Sorvall RC6plus centrifuge, Eppendorf mini-centrifuge, Eppendorf refrigerated mini-centrifuge, Millipore water purification system, Evos fluorescent microscope, heat block, water bath, power supplies, and shaker. Funding from grants obtained by Drs. Holz and Vigodner were directed to the purchase of an environmental chamber for the Evos fluorescent microscope (used for live cell imaging). An inverted microscope with the capacity to photograph living cells was purchased in 2013 for use in the on-campus research laboratory co-occupied by Drs. Schuck and Babich. During the 2011-2012 academic year, the Biology Department purchased two PhotoDoc-It Imaging Systems, to photograph DNA gels, for use in the teaching laboratories and a BioTek Synergy HT Microplate Multimode Microplate Reader for use in research. In the 2010-2011 academic year, through monies obtained from her grant, Dr. Holz purchased a LiCor Odyssey near-infrared imaging system, a Promega 96-well plate dual-injector spectrophotometer and luminometer, and a Millipore Q3 water purification system. Pooling funding from their grants, Drs. Vigodner and Holz purchased a BioRad real-time PCR optical system. The following equipment was purchased within the prior six years: six VIS/UV spectrophotometers, five inverted microscopes, a Nikon TE2000S epifluorescent inverted microscope system with NIS-Elements research imaging software, a Guava EasyCyte benchtop microcytometry system, Protean II vertical gel electrophoresis system and Transblot cell with power supply for use with gels and western blots, a Glomax 20/20 luminometer, a photodocumentation center, and two laminar flow hoods.

To enhance the **laboratory experiences** in the introductory Biology courses, both for Biology majors (Principles of Biology) and for non-majors (Human Biology), in the Summer, 2008 forty brightfield microscopes were purchased. In the Summer, 2009, Moticam microscope cameras, projectors, and screens were installed in the two laboratories in which the major and non-major introductory biology courses meet. The camera was interfaced with a computer, allowing the microscope image to be projected on the large screen in front of the room. Furthermore, the computer with projector and screen was a valuable addition for instructors who use PowerPoint presentations as part of their lectures. Three thermocyclers, for use in polymerase chain reactions and purchased in the Summer, 2010, are housed in the Sussman laboratory, a state-of-the-art laboratory utilized for the advanced biology courses. Financed through the Alexander Foundation, in

Fall, 2016, a Coulter counter was purchased to enhance student laboratory experiences in the courses.

In the 2015-2016 academic year, the **Biology Club** organized a series of career workshops for SCW students majoring in Biology. One particularly nice and informative workshop included a panel of SCW graduates from a variety of professions who spoke about their particular fields of interest. Another workshop focused on instructing the protocol for formulating a resume and writing a cover letter for summer internship applications. A rather "fun" seminar was "Meet and munch with SCW Biology faculty," in which the biology faculty discussed their research and courses. The Biology Club held its annual fundraiser to raise awareness about breast cancer and to benefit "Sharsheret."

In summer 2016, Dr. Alyssa Schuck taught Microbiology, lecture and laboratory.



Dr. Alyssa Schuck (left) working with student Ariella Kerendian (SCW'17) during the summer 2016 Microbiology lab class.

Dr. Levy Amar, in summer 2016, taught Human Physiology, lecture and laboratory. Dr. Amar recently joined the Biology Department as a full-time faculty member; he received a B.A. from Yeshiva College, a Ph.D. in Biomedical Engineering from Columbia University, and is an EMT.

Dr. Levy Amar (center) with the summer 2016 Human Physiology class.

Department of Chemistry and Biochemistry

Faculty: Lora Danley, M.S.; Cecily Dobin, M.S.; Donald Estes, Ph.D.; Jianfeng Jiang, Ph.D.; Daniel Lim, Ph.D.; Evan Mintzer, Ph.D.; Somdeb Mitra, Ph.D.; Chaya Rapp, Ph.D.; Rosalyn Strauss, Ph.D.

In keeping with the approach to science education at SCW, the Department of Chemistry and Biochemistry offers a series of high level courses, opportunities for undergraduate research, and extracurricular programming to foster an enthusiasm for science and an interest in scientific research.

The research group of Dr. Chaya Rapp is involved in computational studies of protein structure and function. Recent graduates Rachel Kirshenbaum, Elizabeth Goldberger and Talya Laufer were co-authors on a paper entitled "Cation-π Interactions of Methylated Ammonium Ions: A Quantum Mechanical Study." Avital Shulman studied the effects of glycosylation on enzyme activity in γ-Glutamyltranspeptidase. Rachel Goldreich was involved in a collaboration with the department of Biochemistry at AECOM in which she studied the mechanism through which apoptosis is initiated by BIM-SHAB activation of the BAX protein.

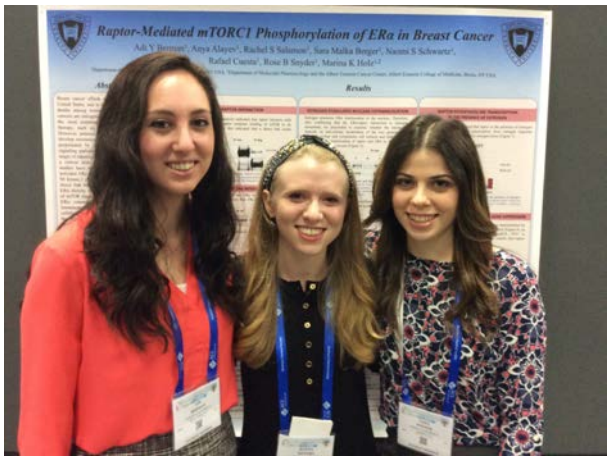
Dr. Jiang is interested in structures and functions of the active sites of metallo-enzymes by the synthesis and reactivity studies of the active sites' structural analogue complexes. Current student Miriam Stock is working on catalytic oxidation of carbonmonoxide by nickel and copper complexes at ambient condition. Miriam attended the 253th ACS meeting at San Diego and presented her study of carbon monoxide oxidation and carbon monoxide powered fuel cells as a poster.

Research projects in Dr. Lim's laboratory include the development of synthetic methodology involving asymmetric catalysis and development of new bond forming reactions with applications to the total synthesis of biologically significant natural products. Research students will learn strategies and techniques employed in synthetic organic chemistry, but more importantly, to appreciate the challenges and nuances associated with research in this discipline.

The Stern College Chemistry club, advised by Drs. Estes and Rapp, is an award winning affiliate of the American Chemical Society (ACS) and has earned seven Innovative Activities Grants and six Community Interaction Grants over the past eight years. In addition, travel grants were obtained to support students' attendance at ACS meetings. Each year the club runs activities related to a particular theme; recent themes have included "Coloring the World in Chemistry", "Chemistry and Outer Space", "Chemistry and the Mind" and "Chemistry and Cosmetics". Activities included celebrating National Chemistry Week by participating in an outreach event at the New York Hall of Science, hosting a discussion on

breast cancer research, and organizing an outreach program at a New York City elementary school. To interest the entire student body, a magic show directed by Mrs. Cecily Dobin, and a National Chemistry Week event, were included in the Club's activities on campus. Over the past decade the Club has been presented with Outstanding, Commendable, Honorable Mention, and Green Chemistry awards at ACS national meetings. For the 2015-2016 year, Drs. Don Estes and Marina Holz accompanied several student representatives to present their research and accept their student affiliate branch award at the ACS national meeting in San Diego, California.

Student representatives along with Dr. Marina Holz and Dr. Don Estes after the undergraduate awards ceremony at the ACS national meeting in San Diego.



Adi Berman Cohen, Dafna Meyers, and Sara Weiner, the student presenters at the undergraduate poster session of the 2016 ACS meeting in San Diego.

Chemistry Club members at an outreach event at a New York City elementary school.

Chemistry Club members at the annual magic show.

Our chemistry laboratories are modernized and make use of state of the art instrumentation; recent purchases include a nuclear magnetic resonance spectrometer, an infrared spectrometer, a polarimeter, an automatic titrator, an isothermal titration calorimeter, and a multimode plate reader. Data acquisition software and probes as well as molecular modeling software were acquired and the laboratory courses were upgraded to include use of these computational programs. Course offerings include an honors track General Chemistry course in addition to a standard course, and a rigorous mathematically based Physical Chemistry course. Our curriculum in the organic chemistry laboratory was recently revised to reflect the changes in the MCAT format. Courses in analytical chemistry and biochemistry incorporate experiments that are related to the instructors' research interests allowing content to be taught in the context of current, cutting edge, and biologically relevant research. A chemistry course for non-science majors, examining chemistry as it relates to the world around us and contemporary environmental issues, is also offered.

Our department offers majors in Chemistry and Biochemistry. Chemistry and Biochemistry graduates have gone on to medical, dental, optometry, and law schools; graduate programs in the sciences; and careers in science education.

Department of Physics

Faculty: Anatoly Frenkel, Ph.D.; Emil Prodan, Ph.D.; Lea Ferreira dos Santos, Ph.D.; Mark Edelman, Ph.D.

The commitment of faculty to the “research and discovery approach” to education is a hallmark of Physics Department at Stern College for Women (SCW). Talented students will aspire to a degree in physics due to the opportunities that have been created in the department over the last few years. Students have access to the state of the art computational labs established at Stern College, to experimental facilities in the National Laboratories and major research centers through collaborative research and education programs that the Physics Department has created. All faculties pursue an active research agenda, their articles being published in prestigious professional journals and their work has been highlighted in several occasions and awarded with major research grants. The exposure to such first class science and the atmosphere of discoveries plays a major role for undergraduate students shaping their career plans.

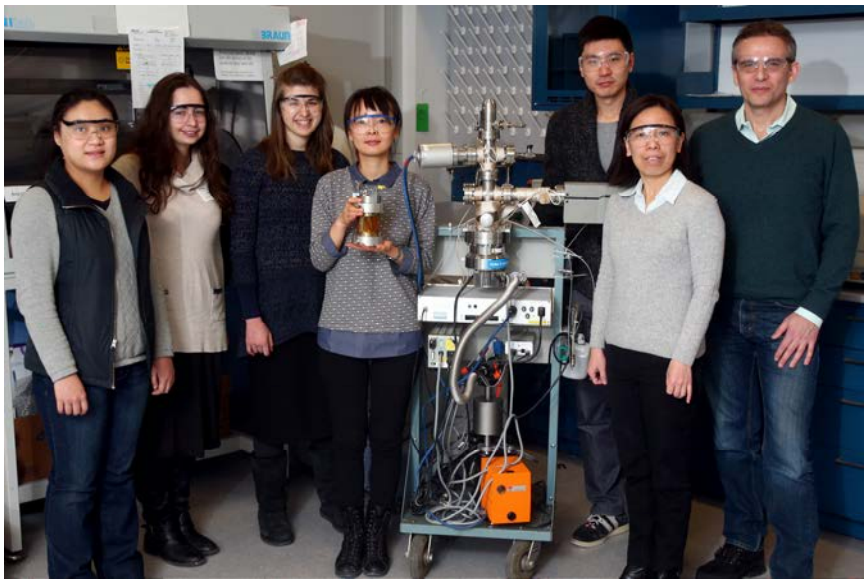
Stern College students who are interested in physics, physical sciences or engineering have an opportunity to actively participate in faculty research. The Physics Department is always seeking new students interested in doing first class research. They can choose from a variety of projects and work under the guidance of physics department members. Stern physics students undertake research during the summers and throughout the year. They present their results at national and international science meetings and give seminar talks. Physics, Physical Sciences and Pre-engineering students, mentored by Department faculty, are also coauthors in refereed articles published in physics, chemistry, and materials science journals. For example, in 2015, Alyssa Lerner, a physics major, coauthored an article in Applied Physics Letters, a premier journal in the physics field.

The Physics Department faculty members have active research programs in experimental and theoretical physics. Drs. Lea Ferreira dos Santos and Emil Prodan specialize in theoretical condensed matter physics. Dr. Santos’ research interests include quantum entanglement, quantum chaos and control, random matrix theory, quantum computing, among many others. Her research is supported by a CAREER grant from the National Science Foundation. The grant also supports a postdoctoral research associate. Dr. Prodan’s interests are in topological insulators, strongly correlated systems, bio-materials, charge and spin transport. His research is supported by two research grants from the National Science Foundation, one of which is also a CAREER grant. He also has a support for one postdoctoral research associate. Dr. Edelman is a theoretical physicist who specializes in chaos theory, dynamical systems and astrophysics. His recent accomplishments include a position as an editorial board member at the Journal of Applied Nonlinear Dynamics. Dr. Frenkel is an experimental physicist who runs federally funded research programs in nanoscience and nano-catalysis at

Brookhaven National Laboratory on Long Island. He is a founding director of a Synchrotron Catalysis Consortium at Brookhaven National Laboratory. He is supported by grants from Natoinal Science Foundation, Department of Energy and Department of Defense. Many research activities involving SCW students take place at the Consortium facilities. His other grants support his research in properties of applied materials, such as semiconductors and electrostrictors. He supports six postdoctoral research associates and hosts visiting resident scientists every year.

Physics students benefit from an intense and challenging curriculum. In the spring of 2016, the physics courses offered included General Physics (calculus based), Introductory Physics (algebra based), and Intermediate Experimental Physics.

The Department also runs a weakly seminar where scientists from other universities are invited to present their latest research findings in front of the students and the faculty members.



Frenkel research group at Brookhaven National Laboratory. From left to right: Dr. Jing Liu, Alyssa Lerner (SCW), Esti Zacharowicz (SCW), Dr. Yuanyuan Li, Dr. Shen Zhao, Dr. Qi Wang and Prof. Anatoly Frenkel

Department of Psychology

Faculty: Joshua Bacon, Ph.D. (Co-Chair); Terry DiLorenzo, Ph.D.; Rachel Ebner, Ph.D.; Aharon Hersh Fried, Ph.D.; Marcel Perlman, Ph.D.

As a discipline, Psychology is generally categorized as a Social Science together with other fields such as Social Work, Political Science, Economics, and Sociology. However, scientific methodology and empirical research have always been a critical component of the coursework and extra-curricular opportunities offered by our department. Experimental Psychology, as a prerequisite for the majority of other courses offered, highlights the fundamental importance that we place on understanding the subject matter of psychology in the context of rigorous empirical analysis, research methodology, and scientific thinking. The Research Seminar, a course taken psychology majors who are interested in pursuing a doctorate in Psychology, provides students with research opportunities and classroom instruction that advance their understanding in the application of methodology to a "real life" setting. Some courses such as Cognition, Learning, and Psychobiology are rooted in the tradition of research and easily fit into the Science framework. Many other courses such as Social Psychology, Developmental Psychology, Psychology and Religion, Personality, Abnormal Psychology, and Cross-Cultural Social Development are brought into the arena of Science by faculty who are grounded in scientific methodology and all have active research programs.

In addition to the general psychology major, the department also offers to specialty tracks, one in Developmental Psychology and one in Behavioral Neuroscience. The developmental track offers a focused education to students who are interested in an in-depth examination of developmental research and theory throughout the lifespan. Aside from receiving a basic grounding in psychology through the core courses required for all majors, they will take the Theories of Development course along with advanced electives in each of the three major developmental stages (childhood, adolescence, and adulthood).

The Behavioral Neuroscience Track option for Psychology majors provides a focused education to students who are interested in the biology behind human and animal behavior. In addition to the core courses that are required of all majors, further requirements and electives come from critical courses in Neuroscience, such as Cognitive Neuroscience, Behavioral Neuroendocrinology, and a Neurobiology lecture and lab.

Students who are planning to apply to Ph.D. or Psy.D. programs in Psychology or to pursue careers in the other health-related fields such as Physical, Occupational, or Speech Therapy, are encouraged to become actively engaged in research. Students have gained invaluable experience outside the classroom by learning about the fundamental role of research in theory and practice of psychology by working with faculty members in

projects off-campus such as with Dr Joshua Bacon in the M.S. Care Center at NYU or with Dr. Aharon Fried on his research in Special Education in the Hebrew Schools. On campus, students have worked on research projects with Dr. Terry DiLorenzo focusing on health-related attitudes and cognitions and their relations to health behaviors. Many of these students have coauthored presentations at both national and international conferences.

For students whose interests lie in areas outside of those of the department, opportunities are available in a number of academic, hospital, and clinical settings. In this case, a faculty member may serve as a supervisor to maintain continuity of the student's experience as an integrated part of her program in psychology.

Students engaged in research are encouraged to present their work at the Annual Behavioral Sciences Student Research Conference held at the Ferkauf Graduate School of Psychology of Yeshiva University. The conference serves as a valuable opportunity for undergraduates to discuss their research in an academic setting and meet other undergraduate and graduate students involved in research.

Below, we introduce the members of the Psychology Department and we look forward to the continued contributions of the Behavioral Sciences to Women in Science.

Dr. Joshua Bacon received his Ph.D. from NYU in 1976. During this time, he also conducted research at Swarthmore College with Dr. Hans Wallach, one of the last remaining students of Wolfgang Kohler, the founder of Gestalt Psychology. In 1976, Dr. Bacon obtained a position as Assistant Professor at Tufts University in Boston and received tenure in 1984. At that time, he was recruited by Yeshiva University and joined the Department of Psychology in 1984.. He teaches basic courses in Experimental Psychology andCognition, as well as the Cognitive Neuroscience course that is a basic requirement for the Behavioral Neuroscience track.. Dr. Bacon's area of research is perception and cognition and, in particular, cognitive impairment and rehabilitation in patients with Multiple Sclerosis. He holds an Adjunct Assistant Professor position in the Department of Neurology of the NYU Medical School and is a member of the clinical and research team in the Multiple Sclerosis Care Center of NYUHJD. He is currently working on a cognitive rehabilitation program for MS patients with cognitive impairments and is also the principle investigator of a project to develop a diagnostic battery that will measure subtle cognitive impairments that may emerge in the early stages of MS. Some of his recent studies have looked at the correlation between performance on one of the behavioral tests of cross hemisphere processing he developed and atrophy of the corpus callosum as seen on MRI scans. Undergraduate students from Stern College have been and continue to be involved in this research and have been coauthors on a number of poster presentations at conferences of the Academy of Neurology and of the Multiple Sclerosis Consortium.

Dr. Terry DiLorenzo received a B.A. in psychology from Rutgers University and a Ph.D. in Health Psychology from Ferkauf Graduate School of Psychology of Yeshiva University. She completed a postdoctoral fellowship at Memorial Sloan-Kettering Cancer Center and then was the Director of Research of the Multiple Sclerosis Comprehensive Care Center of New York Medical College until she joined the Psychology Department of Stern College for Women in 1999. Since joining the Department, Dr. DiLorenzo has conducted several studies examining health-related attitudes and cognitions and their relations to health behaviors. Dr. DiLorenzo has also conducted research on the psychometric properties of scales to assess mood and attitudes toward seeking health care. Dr. DiLorenzo also has an interest in sexual health behaviors and has completed a pilot study on sexual health practices in Orthodox Jewish women. Dr. DiLorenzo has published her findings in articles in peer-reviewed journals and has presented at many professional meetings. In addition to her own research, Dr. DiLorenzo has mentored several honors students whose projects have been presented at professional meetings as well. Dr. DiLorenzo teaches several advanced courses including Human Sexuality, the Honor's Psychology Research Seminar, and Introduction to Public Health, in addition to Abnormal and Social Psychology. Dr. DiLorenzo also coordinates the recently developed Public Health Minor at Stern College.

Dr. Rachel Ebner received a Ph.D. in Educational Psychology from the CUNY Graduate Center, where she concentrated in Learning, Development, and Instruction. She also earned an Ed.M. in Prevention Science and Practice from the Harvard Graduate School of Education and an M.A. in Developmental Psychology from Columbia University's Teachers College. Her postdoctoral research has focused on devising and implementing methods to help students self-regulate their learning, especially when learning online. She has taught a variety of courses on child & adolescent development and educational psychology. In addition to teaching at Stern, she also serves as Yeshiva University's Director of Student Learning Assessment. She works with faculty and administrators on developing and supporting their programmatic learning assessment activities.

Dr. Aharon Hersh Fried received his doctorate at the New School for Social Research. His research and his dissertation were in the area of Visual perception. He taught at Hunter College and John Jay College, both of CUNY, before joining SCW where he is Associate Professor of Psychology and Education. Amongst the courses he teaches are, Psychology & Religion, Developmental Psychology, and Psychological Tests and Measurements. Outside of SCW he is best known for his work in developing programs in Special Education for the dual curriculum Hebrew Day Schools. Dr. Fried's research and writing interests are focused on the synthesis of Psychological and Educational research on cognition, education, and ethical and moral development with the source material of Judaic Studies. He has developed a widely used test of Hebrew Reading, and is currently involved in developing

a test of Hebrew Vocabulary, and of a program for teaching Talmud in the elementary schools. Dr. Fried also maintains a private practice in Psychology, evaluating children who have learning or behavioral problems in school and guiding their parents and teachers in working with them.

Dr. Amanda C. Mitchell received her B.S. in Biology and Ph.D in Neuroscience from Vanderbilt University in Nashville, TN. She is currently a postdoctoral fellow in the Departments of Psychiatry and Neuroscience at the Icahn School of Medicine at Mount Sinai where she studies the role of transcription factors in modifying working memory behaviors in the context of neuropsychiatric disorders in the neuro-epigenetics laboratory of Schahram Akbarian. Dr. Mitchell joined the Psychology and Biology Departments of Stern College for Women in 2014 as an Adjunct Assistant Professor. Throughout her time at Stern, Dr. Mitchell has supervised several Stern students on research projects in the Akbarian neuro-epigenetics laboratory. She currently teaches Psychobiology, Neurobiology, and Behavioral Neuroendocrinology and advises students with Neuroscience oriented Honors Dissertations.

Dr. Marcel Perlman earned his B.A., M.A., as well as his Ph.D. from Yeshiva University. He received his Doctorate in 1959. In 1958 he was appointed as an Instructor in Psychology at SCW, and in 1959 he was promoted to the rank of Assistant Professor. He became an Associate Professor in 1966 and attained his Professorship in 1979. Dr. Perlman became Chairman of the Division of Social and Behavioral Sciences in 2003. He has been a Clinical Supervisor at Ferkauf School of Psychology since 1982. As part of his Forensic Experience he has lectured for the Practicing Law Institute in the Area of Clinical Psychology and the Law. He is currently in limited Private Practice in Clinical and Forensic Psychology. Additionally, he has given numerous lectures and presentations, the latest of which was at the Oxford University (St. Anne's College) Annual Round Table on the topic of the Changing Paradigms of Contemporary Parenting.

Department of Speech Pathology/Audiology

Faculty: Joseph Danto, PhD (chair); Neva Goldstein Hellman, MS; Susan Wilson, MS; Sydney Horn-Klein, MS; Allison Kaufman, AuD; Ashley Small, MS

The mission of the Speech and Hearing Sciences Department (affectionately known on campus as the Department of Speech Pathology/Audiology) is to prepare students for admission to advanced graduate programs in the fields of Speech Language Pathology and Audiology. Emphasis is placed upon the student acquiring knowledge of the underlying anatomy, physiology, physics, and philosophies of the mechanisms of speech, hearing, and language and of their development, impairment, and amelioration.

The students in the Department begin their investigation into speech, hearing, and language at the end of their sophomore year. The course sequence is relatively fixed and is designed to build the more advanced courses upon foundations established in the introductory classes. An active on-campus Speech and Hearing Club coalesces the student body and guides the newer students through an array of extracurricular options. Such extracurricular exposures enhance student appreciation of the practical and clinical applications of their academic preparation, and as well opening the door to questioning and investigating, as a prelude to research.

Students in the program have developed two initiatives to enhance and enrich their involvement in speech language pathology and audiology. The first initiative is the Speech and Hearing Journal, authored, edited, and published by students. The topics vary and have included language, speech and hearing issues related to autism and mutism, the effects of high sound levels on hearing, room acoustic resonance on speech, bilingual effects on non-fluent speech…among others.

The second initiative is a newsletter, providing the students with a less-formal format to share clinical and professional experiences with their peers, to update academic, administrative, and student-related issues, and, of course, to communicate social factors, as well. Students form a close association and relationship during their residence in the program. As the course sequence is "lock-stepped," students are class colleagues for over two years, with an association enhanced by several projects that encourage team working.

The Speech and Hearing Club provides another opportunity to expand their experience in speech pathology and audiology. Renowned speakers from outside the university, including former students, address the student body on clinical, administrative, and other professional topics. A highlight of the academic year is a series on "Grad School Nights," in which representatives from several graduate programs - either faculty or graduate students -

address our students as to the requirements, the advantages of each program, and the application processes.

One of the more recent primary research projects in which our students participated was an analysis of the effects of cervical spine surgery on dysphagia and dysphonia. The project, completed at North Shore University Hospital, presented the students with a very different view of the hospital environment. Whereas most of their experiences are in the clinical area, this gave the students an opportunity to work with an anesthesiologist and to observe patient record evaluation.

In addition to involvements with Speech Pathology/Audiology services at local institutions, our students had opportunities to observe surgery of the spine and of the brain, as they shadowed audiologists involved in this subspecialty.

The entry level degree for Speech Pathology is a Masters and for Audiology it is a Doctorate. Traditionally, our students are accepted into graduate school at an impressive high percentage of those applying. Most have continued to clinical positions, others have become academicians and some have returned to Stern College as adjunct faculty. Students graduating in May, 2016, continued in graduate programs in speech pathology/audiology at Touro College, Lehman College, Queens College, St. Johns University, and Adelphi University.

Stern College for Women Combined Programs

The following are the basic elements of combined degree programs in the sciences available to Stern College students in cooperation with other universities. Students interested in these programs generally apply to the cooperating institution during their junior year and are given a special shaped major so that they can complete all of the necessary prerequisites within the required time frame. The indicated years of study at Stern College includes the year of study abroad in Israel for those pursuing that option after high school. These programs are competitive and final admissions decisions are made by the cooperating institutions.

Engineering - B.A. /B.E. /B.S. or B.A. /M.S.

Yeshiva University offers combined plans in engineering with Columbia University School of Engineering and Applied Science (CU) as well as with the State University of New York at Stony Brook College of Engineering and Applied Sciences (SBU)
Under the BA/BS plan with Columbia, a student who maintains a 3.3 average overall as well as in Program-required courses (with no grade lower than a B in courses required by Columbia), and receives the recommendation of the pre-engineering adviser is admitted to Columbia University School of Engineering and Applied Science. Upon successful completion of the two-year program at Columbia, YU confers the Bachelor of Arts degree and Columbia confers the Bachelor of Science degree.

Under the combined plan with Stony Brook University, a student can earn both a B.A. degree from YU and a B.E. degree in engineering (or, in some cases, an M.E.) from Stony Brook University. Students in combined plans must maintain registration at Yeshiva University by filing a Leave of Absence Form until they receive the B.A. degree. They must meet all specific graduation requirements (other than completing the 128 credits required for graduation) before continuing in the school of engineering.

Nursing - B.A./B.S.N./M.S.N.

Stern College offers a combined program in nursing with New York University's College of Nursing (NYUCN). In this program, students complete 7 semesters of required course work with a minimum of 119 credits at Stern College (5 semesters and 84 credits in residence at Stern College for those students studying in Israel for a year). Eligible students may then be admitted to a 15-month accelerated program at NYUCN which begins in January. Students receive a BA degree from Stern College for Women after successfully completing one semester at NYUCN. They are awarded the BSN from NYU at the successful completion of the nursing school and have the option of continuing on for a master's degree.

Occupational Therapy - B.A./M.S.

Stern College offers a combined program in Occupational Therapy with Columbia University (CU). During the first 3 years at SCW, students complete college requirements and prerequisites for CU's OT program. They apply to the 2-year CU program during the fall semester of their junior year. Students are awarded the B.A. from Stern College after their first year at CU, and the M.S. upon completion of the program.

Optometry - B.A./O.D.

Stern College and the State University of New York (SUNY) College of Optometry offer an affiliation program to qualified students through which they can receive an undergraduate degree and a Doctor of Optometry degree in seven years. Students accepted into this program attend SCW for three years while they complete college requirements and prerequisites for the College of Optometry. After the first year at SUNY College of Optometry, students receive the B.A. degree. The O.D. degree is awarded after completing the four years at SUNY College of Optometry

Physical Therapy - B.A./D.P.T.

Stern College offers combined program in Physical Therapy with Rutgers, the State University of New Jersey.During their first three years at Stern College, students complete college requirements and prerequisites for the Doctorate of Physical Therapy Program. Students are awarded the B.A. after completing the first year at the professional school, and the D.P.T. upon successful completion of the 3-year program.

In addition, though an Articulation Agreement with the New York Medical College Graduate School of Health Sciences (NYMC), students may apply to NYMC's Early Acceptance Program. Qualified students receive provisional acceptance to the 3-year D.P.T. Program after their junior year, while final acceptance is granted upon satisfactory completion of their senior year at SCW.

Physician Assistant - B.A./M.S.

Stern College offers a combined program in Physician Assistant Studies with Mercy College. During the first three years, students complete college requirements and prerequisites for Mercy College's M.S. program. After completing 111 credits with a minimum overall GPA of 3.0, a minimum 3.2 GPA in the designated science courses and with at least a "B" in prerequisite courses, accepted applicants to the program continue at Mercy College. After the first year at Mercy College, students receive the B.A. degree from Stern College. The M.S. degree is awarded after completing two years and three months at Mercy.

Podiatry - B.A./D.P.M.

Stern College and the New York College of Podiatric Medicine offer a combined program in Podiatry. During the first three years, students recommended to the program complete college requirements and prerequisites for the NY College of Podiatric Medicine. After the first year at NYCPM, SCW awards the B.A. NYCPM awards the D.P.M. at the completion of the program.

Teaching, Math and Science - B.A./M.A.

Through an articulation agreement with the NYU Steinhardt School of Culture, Education, and Human Development, Yeshiva University juniors and seniors may enroll in selected math or science education courses at NYU. These courses will count both toward the undergraduate degree at SCW and will reduce the number of credits needed for a M.S. degree in math education or in science education from NYU Steinhardt. Students pay NYU directly for these credits.

Nutrition

Through an articulation agreement, SCW students may take selected courses in nutrition at NYU during their senior year at SCW and thus accelerate the time required to complete a subsequent degree in nutrition at NYU.

The Anne Scheiber Fellowship Program

The Anne Scheiber Fellowship Program provides scholarship support to Stern College undergraduates, as well as graduates, pursing their advanced training at the Albert Einstein College of Medicine. The program, established by Ms. Scheiber through a twenty two million dollar bequest, seeks to support high achieving women with financial need to realize their academic and professional goals. Stern College graduates who attend the University's Albert Einstein College of Medicine may apply for awards up to full tuition for their four years of medical training. We proudly salute the Anne Scheiber Fellows who are fulfilling Ms. Scheiber's dream:

Chaya Abelow
Agnes Nathalie Abitol
Nechama Ackerman
Diane Algava
Kayla Applebaum
Abigail Atlas
Miriam Ausubel
Rachel Aviv
Deena Avner
Tamar Belsh
Nomi Ben-Zvi
Abigail Bergman
Deena Blanchard
Rachel Blinick
Yael Boyarsky
Zahava (Nilly) Brodt
Faigy Burekhovich
Tzipa Chaim
Aliza Charlop
Esti Charlop
Emily Chase
Elana Clark
Barrie Cohen
Davida Cohen
Michelle Cohen
Sarit Cohen
Jennifer Deluty
Ellen Dinerman
Nechama Drefus
Danielle Dubin
Batya Edelman
Esti Feder
Abigail Feldman
Tova Fischer
Rose Fluss
Aliza Forman
Rena Frankel
Tamara Freiden
Ahuva Freilich
Caryn Gamss
Julie Gilbert
Avigayil Ginsberg
Aviva Ginsburg
Ariella Glueck
Elizabeth Goldberger
Dina Golfeiz
Sharon Gordon
Reena Gottesman
Jessica Gross
Rebecca Gross
Michelle Haimowitz
Orli Haken
Rebecca Herskovitz
Batya Hertzberg
Ariella Hollander
Wendy Hosinking
Tsipora Huisman
Julia Josowitz
Chava Kahn
Elisa Karp
Shira Kaye
Rachel Kirshenbaum
Hadassah Klerman
Lea Kozirovsky
Aimee Krausz
Malka Krupka
Yosefa Lerner
Rikah Lerer
Elisheva Levine
Elana Levy

Emily Liebling
Elizabeth Lobell
Shira Marder
Alexandra Michalowski
Esther Mizrachi
Sara Mizrachi
Ariella Nadler
Sarah Nattel
Helen Nissim
Saran Noble
Chana Gila Ovitz
Chaya Pinson
Yardanna Platt
Tehilla Raviv
Yael Raymon
Shuli Roditi-Kulak
Shira Roszler
Rachel Rubinstein
Chava Ruderman
Debbie Rybak
Esther Leah Schoenbrum
Chana Schonbrun
Naomi Schneider
Naomi Schwartz
Yosefa Schoor
Samantha Selesny
Eliana Shaul
Necahma Mina Shoshani
Malki Silverman
Michelle Simpser
Rose Snyder
Shani Snyder
Tirtza Spiegel
Miriam Steinberger
Tehilla Stepansky
Chana Stern
Temima Strauss
Jessica Tugetman
Tamar Riegel Weinberger
Yehudit Weinberger
Amanda Weiss
Meredith Weiss
Rebecca Weiss
Bella Wolf
Sahar Zaghi

Student Accomplishments

Academic Year 2015-2016 and Summer 2016

Department of Biology, Department of Chemistry and Biochemistry, Department of Physics, Department of Psychology, and Speech Pathology/Audiology

Graduate/Professional Program	Specific Institutions; # of attendees
Allopathic medical school	Albert Einstein College of Medicine (6 students); additional 11 graduates in various American (including Columbia Univ.; Hofstra; Jefferson; Downstate; NY Medical; Quinnipiac Univ.), Canadian (Univ. Toronto), Israeli (Technion; Ben Gurion) medical schools
Osteopathic medical school	NY College of Osteopathic Medicine (1 student)
Dental school	NYU; Boston Univ.; Univ. Maryland; Rutgers (9 students)
Biomedical sciences (Ph.D.)	Weill Cornell (1 student)
Clinical psychology (Ph.D.)	Fairleigh Dickinson; Univ. Albany (3 students)
Clinical-developmental Psychology (Ph.D.)	York Univ. (Canada) (1 student)
Clinical psychology (PsyD)	Hofstra Univ.; Univ. Albany (2 students)
Physical therapy (doctorate)	Columbia Univ.; Touro; Hunter; Florida International Univ. (12 students)
Forensic Psychology (M.S.)	John Jay (1 student)
Speech pathology/audiology	Touro; St. John; Queens; Lehman; Hofstra (7 students)
Pharmacy (PharmD)	Touro (4 students)
Genetic counseling	LIU (1 student)
Physician assistant	Touro; Rutgers; NY Inst. Technology; Mercy; LIU (7 students)
Biotechnology (M.S.)	Columbia Univ. (1 student)
Biomedical engineering (M.S.)	Univ. Pennsylvania; Rutgers (2 students)
Occupational therapy	NYU; SUNY Downstate (5 students)
Nutrition (M.S.)	NYU (4 students)
Nursing	NYU; Pace; Hunter; Columbia Univ.; Rutgers (28 students)

Awards

American Society for Biochemistry and Molecular Biology (ASBMB):
Jennifer (Sima) Grossman: selected to the ASBMB Biochemistry & Molecular Biology Honor Society (of 42 outstanding inductees to Chi Omega Lambda this year, 2016).

American Chemical Society (ACS):
Travel grant awarded to the SCW Chemistry Club, a student affiliate chapter of the ACS, to subsidize student travel to the spring, 2016, ACS national meeting in San Diego, CA.

Mindlin Foundation:
$1,500 awarded to Sara Leora Wiener to fund the project, "Combination of rapamycin and resveratrol for treatment of bladder cancer." Dr. Marina Holz's laboratory

In-house Scientific Poster Presentation Contest: **Winners**
Adi Berman, Raptor mediated mTORC1 phosphorylation of ERα in breast cancer.
Sara Leora Wiener, The combined effects of resveratrol and rapamycin in TSC null diseases.

SERC Scholar [SCW graduates, currently medical students at AECOM, have established the undergraduate research internship, the Stern-Einstein Research Connection (SERC) Scholar]:
Daniella Miller

Columbia University's Amgen Scholars Program:
Rina Leah Davidson

Summer 2016, internships

Grace Aharon: Bar Ilan Summer Program

Shira Aharon: NYU Medical Center

Chaya Apfel: Bar Ilan Summer Program

Ariella Applebaum: SURP at AECOM

Yael Arshadina: Bar Ilan Summer Program

Eden Bessaleli: NYU Medical Center (Dr. Tomas Kirchhoff}

Rebecca Burack: College of Staten Island

Aviva Cantor: Bar Ilan Summer Program

Rena Chesir: NYU-Rusk Health Career Opportunity Program (Nurse practitioner)

Hannah Cohen: The Rockefeller University

Rina Leah Davidson: Columbia University's Amgen Scholars Program

Avigayil Dietz: Rutgers University; Dept. Molecular Biol. Biochem. (Dr. Isaac Edery)

Tamar Felman: Bar Ilan Summer Program

Julia Fisher: NYU-Rusk Health Career Opportunity Program (Emergency medicine); Mt. Sinai School of Medicine (Dr. Amanda Mitchell)

Briana Friedman: Bar Ilan Summer Program

Sarah Gold: Bar Ilan Summer Program

Shayna Goldstein: Bar Ilan Summer Program

Rachel Gozland: AECOM (Dept of Neurosciences)

Avital Habshush: Bar Ilan Summer Program

Lily Jacobs: Dermatology practice of Dr. Eliot Ghatan

Temima Kanarfogel: Columbia University Medical Center (Dr. Z. Freyberg)

Haley Kandleshein: Lady Davis Institute, Montreal, Quebec

Ilana Karp: Bar Ilan Summer Program

Yardena Katz: Department of Biology (Dr. Holz)

Hilla Katz-Lichtenstein: Mt Sinai School of Medicine (Dr. Amanda Mitchell)

Miriam Klhar: Bar Ilan Summer Program

Tamar Kwestel: NYU-Rusk Health Career Opportunity Program (Physical therapy)

Lior Levy: Tel Aviv Sourasky Center

Miriam Liebling: AECOM (Dr. Jessica Mar)

Aderet Liss: Children's Hospital (Boston, MA)

Jessica Mayer: SURP at AECOM

Daniella Miller: SERC scholar

Eli Nemetz: Sick Kids Hospital, Toronto (Dr. Mark Camp, pediatric orthopedic surgery)

Lily Ottensoser: Bar Ilan Summer Program

Ayala Ounounou: Columbia University Medical Center (Dr. Z. Freyberg)

Sara Palgon: Bar Ilan Summer Program

Jordanna Rehanny: Fertility lab

Batsheva Reich: The Rockefeller University

Miriam Rosen: Mt Sinai School of Medicine (Dr. E.Bang)

Amanda Rubin; NYU Medical Center (Oncology Surgical Laboratory)

Miriam Saffern: Sloan-Kettering

Nicole Samoohi: Sure-Tox Laboratory, Elmwood Park, NJ

Sara Shkedy: University of Texas MD Anderson Cancer Center (Dr. Ruth Katz).

Rebeccah Simon: Mt Sinai School of Medicine (Dr. Akbarian's lab)

Tehilla Sollofe: Bar Ilan Summer Program

Elisheva Stern: Columbia University Medical Center (Dr. Z. Freyberg)

Allison Tawil: NYU-Rusk Health Career Opportunity Program (Nurse practitioner)

Kelley Tripp: AECOM (Dr. Greenstein)

Sara Wiener: SURP at AECOM

Student Publications and Presentations

Scientific Journals
(Undergraduate names are in **bold** type)

Li. Y., Kraynis, O., Kas, J., Weng, T. C., Sokaras, D., **Zacharowicz, R**., Lubomirsky, I., Frenkel A. I., 2016. Geometry of electromechanically active structures in gadolinium-doped cerium oxides, AIP Advances (*in press*).

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Alayev, A., **Berger, S.M., Kramer, M.Y., Schwartz , S.S.,** and Holz, M.K., 2015, The combination of rapamycin and resveratrol blocks autophagy and induces apoptosis in breast cancer cells, J. Cell. Biochem. 116:450-457.

Pollack, D., Xiao, Y., Shrivasatava, V., **Levy, A., Andrusier, M.,** D'Armiento, J., Holz, M.K., and Vigodner, M., 2015, CDK14 expression is down-regulated by cigarette smoke *in vivo* and *in vitro*, Toxicol. Lett. 234:120-130.

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and selectively induces apoptosis in TSC-2 deficient cells, Cell Cycle, 13: 371-382.

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Presentations at Scientific Conferences
(Undergraduate names are in **bold** type)

Berman, A.Y., Alayev, A., Salamon, R.S., Berger, S.M., Schwartz, N.S, Cuesta, R., and Holz, M.K., 2016, Raptor mediated mTORC1 phosphorylation of ERα in breast cancer, 251st National Meeting of the American Chemical Society, San Diego, CA, March.

Wiener, S.L., Berman, A.Y., Alayev, A., Salamon, R.S., Sun, Y., Schwartz, N.S., Yu, J.J., and Holz, M.K., 2016, The combined effects of resveratrol and rapamycin in TSC null diseases, 251st National Meeting of the American Chemical Society, San Diego, CA, March.

Meyers, D., Martinez, K., and Chang, E.B., 2016, Understanding impaired lipid absorption in germ free mice, 251st National Meeting of the American Chemical Society, San Diego, CA, March.

Wakschlag, N. and DiLorenzo, T., 2016, The association between modest dress and body image in Orthodox Jewish Women. Poster presentation, Annual Meeting of the Society of Behavioral Medicine, Washington, D.C.

Li, Y., Korobko, R., **Lerner**, A., Lubomirsky, I., and Frenkel, A.I., 2015, Origin of giant electrostriction in Gd doped ceria revealed by differential QEXAFS, XAFS-15International Conference, Karlsruhe, Germany, August.

Applebaum, K., recipient of the 2015 UAN Student Travel Award to attend the American Society for Biochemistry and Molecular Biology Annual Meeting, March 28-April 1, Boston Exhibition and Convention Center, MA

Kramer, M.Y., McNabb, N.A., Guillette, L.J., Jr., and Kohno, S., 2015, The potential impacts of environmental endocrine disruptors on reproductive development, 249th National Meeting of the American Chemical Society, Denver, CO.

Gross, R.A., Wooten, A.L., Lewis, Woodard, P., and Lapi, S., 2015, Manganese-52: cyclotron production and PET/MR imaging, 249th National Meeting of the American Chemical Society, Denver, CO.

Kramer, M.Y., McNabb, N.A., Guillette, Jr., L.J., and Kohno, S., 2014, Drugged wildlife: The potential impacts of environmental endocrine disruptors on reproductive development, National Meeting of the Society for Integrative and Comparative Biology, West Palm Beach, FL, Jan. 4th

Kaufman, C., Fulop, T., Boolbol, S.K., Naam, S., Gillego, A., and Chadha, M., 2014, Are more frequent early follow up mammogram protocols necessary after breast-conserving surgery and radiation therapy, San Antonio Breast Cancer Symposium, Dec.

DiLorenzo, T., Freyberg, R, and **Siegel, A**. 2014, Sex education and adherence to sexual health recommendations in Orthodox Jewish Women. Poster presented at the Society of Behavioral Medicine Annual Meeting, Philadelphia, PA, April.

Siegel, A., DiLorenzo, T., Freyberg, R., and Donath, S., 2014, Factors associated with adherence to gynecologic screening recommendations in young Orthodox Jewish Women. Poster at the Society of Behavioral Medicine Annual Meeting, Philadelphia, PA, April.

Lerner, **A**., Li, Y., Frenkel, A.I., Korobko, R., and Lubomirsky, I., 2014, The origin of giant electrostriction in Gd-doped ceria as studied by modulation excitation x-ray absorption spectroscopy, Meeting of the American Physical Society, Denver, CO.

Herskowitz, J., Victor, R., and Mintzer, E., 2014, Daptomycin interactions with TOCL containing membranes, 247th American Chemical Society National Meeting, March, Dallas, TX.

Schoor, Y. and Jordan, B.A., 2014, Prr7 is a novel regulator of the transcription factor, c-Jun, in neurons, 247th American Chemical Society National Meeting, March, Dallas, TX.

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Tishbi, N. and Rapp, C., 2014, The role of sulfation in the CCR5 chemokine receptor complex, 247th American Chemical Society National Meeting, March, Dallas, TX.

Goldsmith, A., Bryan, R., Broitman, J., and Dadchova, E., 2014, Modification of antibody 2556 recognizing HIV protein gp41 with CHXA ligand for radiolabeling and radioimmunotherapy 247th American Chemical Society National Meeting, March Dallas, TX.

Hseih, S.J., Levi, D., Prince, D., Mills, M., Dayton, C., Shah, R., **Zibak, F., Shamsian, J**., and Gong, M.N. 2014, Staged implementation of the ABCDE bundle improves ICU patient outcomes, Amer. Thoracic Soc., Meeting (abstract).

Hseieh, S.J., Hope, A., Dayton, C., Gershengorn, H., Shah, R., **Shamsian, J., Zibak, F**., and Gong, M.N., 2014, The association between pre-ICU frailty and ICU delirium, Amer. Thoracic Soc., Meeting (abstract).

Weisburg, J.H., Schuck, A.G., **Greenbaum, R.E., Golfiez, M.D., Segal, J.R., Weiss, R.A., Liebman, E.C.**, Zuckerbraun, H.L., and Babich, H.,

2013, Grape seed extract, a Mild prooxidant selectively cytotoxic to cancer cells. American Institute for Cancer Research Annual Meeting. Bethesda, MD.

Bonner, C., and DiLorenzo, T., 2013, A review of the literature on cognitive-behavioral therapy for anxiety and depression in school settings. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Donath, S., and DiLorenzo, T., 2013, Remediating academic impacts of early neglect. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

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Kazlow, C., and DiLorenzo, T., 2013, The effects of terrorism on children: The implications of type of trauma, level of exposure, and individual vulnerability. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Last, T., and Freyberg, R., 2013, Cyberbulling: Predictive factors and harmful effects. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Pasternak, E., and Bacon, J., 2013, A modified sound localization task as a sensitive test of processing speed in multiple sclerosis patients. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

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Yarmush, D., and Freyberg, R., 2013, The effect of music on cognitive, verbal, and task performance. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Schuck, A.G., **Wargon, S.E., Tauber, L., Miller, S.H., Weinstock, H.R.,** Weisburg, J.H., Zuckerbraun. H.L., and Babich, H. 2013. Ellagic and gallic acids, dietary polyphenols with selective cytotoxicity to oral carcinoma HSC-2 cells. Society for In Vitro Biology Annual Meeting, Providence, RI

Tishbi, N. and Mintzer, E., 2013, Surface and membrane binding properties of the lipopeptide daptomycin, 57th Annual Meeting of the Biophysical Society, Philadelphia, PA

Joel, K. and Santos, L. F 2013, Spectrum, symmetries, and dynamics of Heisenberg spin-1/2 chains (oral presentation), International Meeting of the American Physical Society, March Meeting, Baltimore, MD.

Kollmar, D. and Santos, L. F 2013, Invariant correlation entropy as a signature of quantum phase transitions in spin-1/2 systems (oral presentation), International Meeting of the American Physical Society, March Meeting, Baltimore, MD.

Laufer, T.S. and Rapp, C. 2013, Effects of tyrosine O-sulfation on binding affinity in CXCR4-SDF-1 complexes, 245th National Meeting of the American Chemical Society, New Orleans, LA.

Snow, S. and Rapp, C., 2013, Role of tyrosine *o*-sulfation in the CXCR4-SDF-1 chemokine receptor complex, 245th National Meeting of the American Chemical Society, New Orleans, LA.

Robin, E.F., Wietschner, J.K., Zuckerbraun, H.L., Babich, H., Schuck, A.G., and Weisburg, H.J., 2013, Gallic acid, an inducer of apoptosis to human oral carcinoma HSC-2 cells as mediated through oxidative stress, 245th National Meeting of the American Chemical Society, New Orleans, LA.

Schoor, Y. and Velisek, 2013, Different route of administration for melanocortin receptor agonist, melanotan II, in the model of cryptogenic infantile spasms, 245th National Meeting of the American Chemical Society, New Orleans, LA.

Weinstein, A., Baker, M.E.R., Hughes, C.M., Allis, D., McEwen, B.S., and Hunter, R.G., 2013, Evidence for the role of a novel histone mark in hippocampal neurogenesis**,** 245th National Meeting of the American Chemical Society, New Orleans, LA.

Sedletcaia, A., **Unger, H.A.,** Maruani, D.M., and Holz, M.K., 2012, New targets of mTORC1 pathway in ER-positive cells, American Association for Cancer Research Annual Meeting, Chicago, IL.

Chitgarha, M.T, Khaleghi, S., Daab, W., Ziyadi, M., Mohajerin-Ariaei, A., **Rogawski, D**., Tur, M., Vusirikala, V., Zhao, W., Touch, J., and Willner, A.E. 2012. Demonstration of WDM OSNR Performance Monitoring and Operating Guidelines for Pol-Muxed 200-Gbit/s 16-QAM and 100-Gbit/s QPSK Data Channels. Optical Fiber Communication Conference and Exposition (OFC).

Amram, R., and DiLorenzo, T., 2012, Prevalence and pedictors of academic dishonesty. Poster to be presented at the Annual Meeting of the American Psychological Association, Orlando, Fl.

Freyberg, R., and **Bart, M**., 2012, Olfactory environment influences close relationships through multiple methods of measurement. Poster presented at the Annual Conference of the Association of Chemoreception Sciences, Huntington Beach, CA.

Gofine, M., and Dilorenzo, T., 2012, How are we doing? A review of assessments within writing centers. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Michalowksi, A., and Freyberg, R., 2012, The effect of directed writing on depression and anxiety. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Pasternak, E., and Bacon, J., 2012, Demystifying insight: A review. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Zughaft, M., Taylor, D.J., and Harburger, L.L., 2012, Effects of endogenous and exogenous sex hormones on object memory and spatial ability in young and aged women. 16th Annual N.E.U.R.O.N. Conference Program.

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Gharagozloo, P., Arcasedda, F., Khatamee, M., Gutierrez-Adan, A., Drevet J., Krey, L., **Mandelbaum, M.,** Smith, M., Kramer, Y., Sanchez, X., Lu, L., McCaffrey, C., and Grifo, J., 2012, Age, sperm, & oocyte stress and infertility, American College of Obstetricians and Gynecologists, May 8th, San Diego, CA

Vigodner, M., Nieves,E., Shrivastava, V., Callaway, M.B., **Marmor, H.,** and **Chernyak, S.-B**., 2012, Identification of sumoylated proteins in human sperm, American Society of Andrology (ASA) 37th Annual Conference, April 21 – 24, Tucson, Arizona.

Hachen, M., Hunter, R.G., Pfaff, D.W., and McEwen, B.S., 2012, Stress modulates mitochondrial gene expression in the rat hippocampus, 243rd American Chemical Society Meeting, San Diego, California, Spring semester.

Gubin A. and Santos L.F., Quantum Chaos: An introduction via chains of interacting spins 1/2, Oral presentation, March Meeting 2011, American Physical Society, Boston, MA.

Karp, E., Novikov, L., **Klerman, H.**, and Gamble, M.J., 2012, Understanding the role of intronic cis-acting elements in the splicing of macroH2A1 variants, 243rd American Chemical Society meeting, San Diego, California, Spring semester.

Wolf, B.J., Reiss, S.E., Babich, H., Weisburg, J.H., Schuck, A., and Zuckerbraun, H., and **Fertel, S.** 2012, Proapoptotic effects of ellagic acid, a metabolite of pomegranate extract, on human oral carcinoma HSC-2 cells, 243rd American Chemical Society meeting, San Diego, California, Spring semester, 2012.

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Hachen, M., Hunter, R.G., Pfaff, D.W. and McEwen, B.S., 2011, Stress modulates mitochondrial gene expression in the rat hippocampus, Society for Neuroscience Abstracts, Washington, D.C.

Shrivastava, V., **Marmor**, **H**., **Gutstein**, **L**., Chernyak, S.-B., and Vigodner, M., 2011, SUMO proteins may regulate multiple functions in human sperm which can be significantly affected by cigarette smoke, FAMRI Web Symposium.

Bart,M., and Freyberg, R., 2011, Fragrance change impacted interactions of close female friends. Chemical Senses, 36, A100-101.

Bacon, J., Kalina, J., Bochkanova, A., **Ausubel-Strauchler, Y.** and Herbert, J., (2011). Cognitive rehabilitation benefits multiple sclerosis patients only if they are active participants in the program. Neurology, 76 (S4): A85.

Harburger, L.L. and **Taylor, D.J.,** (2010). The effects of age on object memory and spatial ability in women. Society for Neuroscience Abstracts, Program # 605.2.

Huisman, T., Chatterjee, S., Volpi, S., and Birshtein, B., 2011, AID and Gadd45a: Involved in active DNA demethylation of the 3'RR and in class switch recombination? 241st American Chemical Society National Meeting, Anaheim, CA, March.

Rogawski, R. and Mintzer, E., 2011, Elucidating the interaction of LPA with model membranes, 241st American Chemical Society National Meeting, Anaheim, CA, March

Rosenblatt, K., Avogadri, F., Li, Y., Murphy,J., Merghoub, T., Houghton, A., and Wolchok, J., 2011, Detection of TRP-2 antibodies in the serum of TRP-2 immunized mice, 241st American Chemical Society National Meeting, Anaheim, CA, March.

Schuck, A.G., **Cohen, S.S., Lerman, L.T., Haken, O.,** and Weisburg, J.H., 2011, Pomegranate and olive fruit extracts, prooxidants with antiproliferative and proapoptotic activities towards HSC-2 carcinoma cells. Society for *In Vitro* Biology Annual Meeting, Raleigh, NC, June

Hasten, E., Lazaros, J., and Schuck, A.G., 2011, Pro-oxidant and pro-apoptotic activities of olive fruit extract toward oral carcinoma cells. Columbia University Undergraduate Research Symposium, April.

Hirth, Y.A., Zuckerbraun, H.L., and Weisburg, J.H., 2011, Decrease in intracellular glutathione and induction of apoptosis in HSC-2 carcinoma cells from the human oral cavity due to pomegranate juice extract. Society for In Vitro Biology Annual Meeting, Raleigh, NC, June

Schneider, J., Gutstein, L., Shrivastava, V., and Vigodner, M., 2011, SUMO proteins may regulate head reshaping, capacitation, and stress response in human sperm, Columbia University Undergraduate Research Symposium, Spring, April.

Hirth, Y.A., Zuckerbraun, H.L., and Weisburg, J.H., 2011, Decrease in intracellular glutathione and induction apoptosis in HSC-2 carcinoma cells from the human oral cavity due to pomegranate juice extract. Society for In Vitro Biology Annual Meeting, Raleigh, NC, June

Schneider, J., Gutstein, L.E., Shrivastava, V., and Vigodner, M. 2011, SUMO proteins may regulate head reshaping, capacitation, and stress response in human sperm, XXIst North American Testis Workshop, Montreal, Quebec, Canada, 3/30-4/2.

Maruani, M., **Harris, E., Shachter, A.,** and Holz, M.K., 2011, Co-regulatory relationship between estrogen receptor alpha and the mTOR/S6K1 signaling pathways, American Association for Cancer Research 102nd Annual meeting, Orlando, FL, April.

Schneider, J., Gutstein, L., Shrivastava, V., and Vigodner, M., 2011, SUMO proteins may regulate head reshaping, capacitation, and stress response in human sperm, Columbia University Undergraduate Research Symposium, Spring.

Gross, J., Ennis, R.D., Homel, P., Evans, A., Gliedman, P., Choi, W., Hu, K., Shasha, D., Harrison, L.B., and S. Fleishman, 2010, The rapid increase in radiation oncology consultation and treatment of the extreme elderly and its independence from population growth, America Society for Radiation Oncology (ASTRO) Annual Meeting.

Marinkovic, N., Wang, Q., Barrio, **Cooper**, C., and Frenkel, A.I., 2010, Synchronous XAFS/DRIFTS Study of CO adsorption on Al2O3-supported

Pt clusters The First North American Core Shell Spectroscopy Conference, Denver, CO.

Donington, J.S., Blasberg, J.D., Goparaju, C.M.V., **Hirsch, N.**, and Pass, H.I., 2010, Molecular heterogeneity of osteopontin Isoforms in non-small cell lung cancer, American Association of Cancer Research, International Association for the Study of Lung Cancer Joint Conference on Molecular Origins of Lung Cancer, Coronado, CA.

Goparaju, C., Donington, J., **Hirsch, N.**, Harrington, R,, and Pass, H.I., 2010, EphB2 expression parallels malignant behavior in mesothelioma, American Association of Cancer Research, 101st Annual Meeting, Washington, D.C.

Donington, J.S., Goparaju, C.M.V., Blasberg, J.D., **Hirsch, N.**, Harrington, R,, Pass, H.I., and Neubert, T., 2010, Extracellular mediation of divergent impact of OPN splice variants in non-small cell lung cancer. Osteopontin Biology, FASEB Summer Research Conference, Steamboat Springs, CO..

Donington,. J.S., Blasberg, J.D., Goparaju, C.M.V., **Hirsch, N.**, Harrington. R., and Pass, H.I., 2010, Argatroban inhibition of osteopontin modulates isoform specific malignant properties in non-small cell lung cancer. 10th Targeted Therapy meeting, Santa Monica, CA (presented but not published).

Gross, J., Ennis, R.D., Homel, P., Evans, A., Gliedman, P., Choi, W., Hu, K., Shasha, D.,Harrison, L.B., and S. Fleishman, 2010, The rapid increase in radiation oncology consultation and treatment of the extreme elderly and its independence from population growth, America Society for Radiation Oncology (ASTRO) Annual Meeting.

Horowitz, D. and Dilorenzo, T., 2010, The efficacy of hypnosis in pediatric cancer care, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Stiefel, E. and Freyberg, R., 2010, Trying to remember: A literature review about improving eye-witness testimony, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Rollhaus, E. and Freyberg, R., 2010, An analysis of the effects of altering directives in narrative therapy, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Scholl, C. and Dilorenzo, T., 2010, The issue of "faking good" on self report personality measures in personnel selection, Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Zitter, S., Bryk, D., Fox, A., Narlieva, M., Pan, Q., Chang, T., Cloherty, G., and Lucic,D., 2010, Swine influenza or seasonal influenza? The first clinical

adaptation of an automated open platform for swine influenza. The Montefiore experience, Young Research Investigators Symposium at Montefiore Medical Center, Bronx, NY, third place winner.

Shrivastava,V., **Miller, R., Lazaros, S.H.,** and Vigodner, M., 2010, Sumoylation as a sensitive marker of a tobacco-induced oxidative stress in the testis, FAMRI meeting, Miami, Florida (May)

Deluty, J., Seto, J., and Sealfon, S., 2010, Elucidating the signaling pathways of the immune response in monocytes, Columbia University Undergraduate Research Symposium, Spring.

Dinerman, J. and Santos, L.F., 2010, Controlling the Evolution of a Quantum System with Dynamical Decoupling Methods, Oral presentation, March Meeting, American Physical Society, Portland, OR.

Holz, M.K., **Seligman F.F., Spiegel T.N.,** and **Maruani D.M.,** 2010, Estrogenic regulation of S6 kinase 1 expression creates a positive feed-forward loop in control of breast cancer cell proliferation, AACR 101st Annual Meeting, Washington, DC.

Huisman, T. and Hodgson, L., 2010, Spectral modification to genetically encoded single-chain RhoA biosensor, 239th National Meeting, American Chemical Society, San Francisco, CA

Liebling, E.J., Asenjo, A.B., De Paoli, V.M., Rath, U., Sharp, D. J., and Sosa, H., 2010, Inte**r**actions between microtubules and kinesin-1,3, 239th National Meeting, American Chemical Society, San Francisco, CA

Mintzer, E., and **Rogawski, R.,** 2010, Elucidating the interaction of LPA with model membranes, Columbia University Undergraduate Research Symposium, Spring.

Solodokin, L.J., **Canter, A., Freilich, A., Haken, O., Ovits-Levy**, C.G., Schuck, A.S., and Babich, H., 2010, Anticarcinogenic and prooxidant properties of pomegranate juice extract and olive fruit extract, Columbia University Undergraduate Research Symposium, Spring.

Weiss, R.S., Zhang, C., and Cuervo, A.M., 2010, Identification of markers for autophagy in serum, 239th National Meeting, American Chemical Society, San Francisco, CA

Yamnik, R.L. and Holz, M.K., 2009, mTOR/S6K1 and MAPK/RSK signaling pathways coordinately regulate estrogen receptor alpha serine 167 phosphorylation, Cancer Res., 69:A31S

Holz. M.K., **Digilova, A., Yamnik, R., Davis, D.,** Murphy. C., and **N. Brodt**, 2009, Estrogen receptor alpha is a target of mTOR/S6K1 signaling in control of breast cancer cell proliferation, Cancer Res. 69:269S (abstract).

Bellman, A. and DiLorenzo, T, 2009, The association between feminism, religiosity, and psychological well-being in Jewish women, Yeshiva University Behavioral Sciences Student Research Conference.

Ganz, D, and DiLorenzo, T, 2009, Comorbid suicidality and alcohol abuse in adolescents: Etiologic factors, Yeshiva University Behavioral Sciences Student Research Conference.

Hanau, T. and DiLorenzo, T, 2009, Etiology and treatment of bulimia nervosa, Yeshiva University Behavioral Sciences Student Research Conference.

Hazan, R. and DiLorenzo, T, 2009, Prolonged/imaginal exposure in PTSD: A literature review, Yeshiva University Behavioral Sciences Student Research Conference.

Hazan, R. and R. Freyberg, 2009, Victim of the act or the offender? Exploring the emotional and psychological responses of sexual assault and rape victims based upon the victim-offender relationship, Yeshiva University Behavioral Sciences Student Research Conference

Miller, R. and Harburger, L, 2009, Does Ben Franklin Effect Increase with Effort? Yeshiva University Behavioral Sciences Student Research Conference

Reichman, D. and DiLorenzo, T, 2009, Influence of family support on PTSD in children, Yeshiva University Behavioral Sciences Student Research Conference.

Rollhaus, E., and R. Freyberg, 2009, Directives in Narrative Therapy, Yeshiva University Behavioral Sciences Student Research Conference

Sonenberg, R. and DiLorenzo, T, 2009, A review of the literature on the psychological effects of 9/11 in children, Yeshiva University Behavioral Sciences Student Research Conference.

Spiegel, T. and DiLorenzo, T, 2009, Does MRI screening have a negative psychological effect on women who carry the BRCA gene? Yeshiva University Behavioral Sciences Student Research Conference.

Stiefel, E. and R. Freyberg, 2009, The multi-faceted Jew: A study on the integration of the interdependent self and the independent self in Jews in America, Yeshiva University Behavioral Sciences Student Research Conference

Dinerman, C., Keller, and B. Herold, 2009, Genital secretions confer anti-*E. coli* activity, Montifiore Pediatric Research Day, 1St prize for a student poster.

Dukesz, F., **Zilbergerts, M.,** and L. F. Santos, 2009, Interplay between interaction and (un)correlated disorder in Heisenberg spin 1/2 chains, March Meeting of the American Physical Society, Pittsburgh

Ackerman, N.J., Burekhovich, F., Schuck, A.G., Zuckerbraun, H.L., and H. Babich, 2009, Gingko biloba leaf extract induces oxidative stress in HSC-2 carcinoma cells, Columbia University Symposium of Undergraduate Research, Spring. (abstract and oral presentation).

Ruderman, E., Zack, E., and A.G. Schuck**,** 2009, Antitumorigenic and prooxidant activities of blueberry extract to human oral cancer cells, Columbia University Undergraduate Research Symposium, Spring. (abstract).

Bromberg, M.R., Patolla, A., Wang, O., Segal, R., Han W.-Q., Feldman, I., Zypman, F.R., Iqhal, Z., and A.I. Frenkel, 2009 , Platinum nanoparticles on SWNT nanopaper support: Synthesis, characterization, and application in electrocatalysis, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Charles, G., and E.A. Mintzer, 2009, Comparison of the behavior of native cholesterol and two oxidized cholesterol derivatives, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Charles, G. and E.A. Mintzer, 2009, Oxysterols alter the propensity of lipid raft formation in model membranes, Columbia University Undergraduate Research Symposium, Spring. (abstract).

Herzberg, B.M., Ting, L.-M., Mwakingwe, A., Croken, M.M., Madrid, D., Hochman, S., and K. Kim, 2009, Genetic studies of adenosine deaminase in the rodent malaria parasites, *Plasmodium yoelii* and *Plasmodium berghei*, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

LeVee, A.J., and E.V. Prodan, 2009, Molecular electronics: Tunneling devices with semiconducting leads, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Liebling, E., Burger, R.F., Zuckerbraun, H.L., Schuck, A.G., and H. Babich, 2009, Protective effects of pyruvate through mediation of oxidative stress, Columbia University Symposium of Undergraduate Research, Spring (abstract).

Merzel, M., Grace, M., and M. Balwani, 2009, Development and validation of a dried blood spot assay for chitotriosidase, an important biomarker for

Gaucher Disease, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)
Pekar, M., Grosser, E., Goodfriend, G., Im, J. and M.Vigodner, 2009, Stress-induced response and apoptosis in germ and somatic testicular cells: involvement of SUMO proteins, Columbia University Symposium of Undergraduate Research, Spring (abstract).

Schiffmiller, A., Rapp, C., Kalyanaraman, C., and M. Jacobson, 2009, Theoretical ranking of a congeneric series of protein kinase inhibitors, Columbia University Symposium of Undergraduate Research, Spring.(abstract)

Holz, M.K., **Digilova, A., Yamnik, R., Davis, D**., Murphy, C., and **N. Brodt,** 2008, The role of S6 kinase 1 in breast cancer, San Antonio Breast Cancer Symposium

Atlas, A., McCarthy, J.W., and M. Feldmesser, 2008, *Aspergillus fumigatus* proteins bound by a germination-inhibitory monoclonal antibody, National Meeting of the American Chemical Society, New Orleans, LA.

Bellman, A. and T. DiLorenzo, 2008, Gender Identity Disorder: A review of the literature. Ferkauf Graduate School of Psychology Behavioral Sciences Student Research Conference

Blau, L., Estes, D**., Seleski, N.** and **S.A**.**Guigui,** 2008, Stabilizing of deoxyoligonucleotide duplexes by base stacking, National Meeting of the American Chemical Society, New Orleans, LA.

Clark, E., Seideman, J., Silverman, J., Gardner, J., Scheinberg, D.A., and J.H.Weisburg, 2008, P-Glycoprotein independent resistance to oxidative stress in leukemia cells, National Meeting of the American Chemical Society, New Orleans, LA.

Dukesz, **F.,** Frenkel, A.I., Bromberg, M.R.,Wang, O., Asherie, N., Blass, S., Rafailovich, M.H., Sun, Y., and J. Kang, 2008, Comparing various methods of synthesis and analysis of gold nanoparticles, National Meeting of the American Chemical Society, New Orleans, LA.

Fathy, J., Seleski, N., Dinerman, E., and M.Vigodner, 2008, Expression of SUMO protein in normal testicular cells and germ cell tumors, Columbia University Spring Undergraduate Research Symposium.

Feldman, A., Benichou, C., Skop, N., and M.Vigodner, 2008, Heat-induced stress response in germ and somatic testicular cells: involvement of SUMO proteins, Columbia University Spring Undergraduate Research Symposium

Freyberg, R., and **M**.**Bensoussan,** 2008, The impact of fragrance on social relationships. Poster presented at the 2008 Biannual Conference on Human Development, Indianapolis, IN.

Freyberg, R., **Bensoussan, M.,** and A. **Silver,** 2008, Disruption of olfactory environment impacts close relationships in young women. National Meeting of the International Symposium of Olfaction and Taste, San Francisco, CA.

Greer, D. and R. Freyberg, 2008, Personality type as a predictor of religious identity and conflicts, Yeshiva University Behavioral Sciences Student Research Conference

Guigui, S.A., House, R., Dulyaninova, N. and A. Bresnick, 2008, Characterization of a scfv to non-muscle myosin-II, National Meeting of the American Chemical Society, New Orleans, LA.

Hazan, R., and T. DiLorenzo, 2008, Treatment methods for PTSD: A literature review, Yeshiva University Behavioral Sciences Student Research Conference

Herzberg, B.M., Ramjeawan, R., Sun, Y., Frenkel, A.I., and M. Rafailovich, 2008, Characterizing protein and folate coated nanoparticles and analyzing their toxic effects on cancerous and normal keratinocytes, National Meeting of the American Chemical Society, New Orleans, LA.

Liebling, E.J., Gottesman, R.T., Citrin, N.S., and H. Babich, 2008, Prooxidant ability of black tea flavin monogallates: studies with carcinoma and normal cells, ColumbiaUniversity Spring Undergraduate Research Symposium.

Oxman, H., and T. DiLorenzo, 2008, Validity of MMPI-2 L scores in Orthodox Jewish undergraduate females. National Meeting of the American Psychology Association, Boston, MA.

Raviv, T., Digilova, A., and A. Schuck, 2008, Synergistic interactions between black tea theaflavins and chemotherapeutics in oral cancer cells, Columbia University Spring Undergraduate Research Symposium. (Note: **Tehilla Raviv and Alla Digilova** also gave this research as an oral presentation).

Reichman, B., and R. Freyberg, 2008, The unique developmental issues and challenges of children with incarcerated mothers, Yeshiva University Behavioral Sciences Student Research Conference

Rollhaus, E., and R. Freyberg, 2008, Effects of written disclosure on mental health, Yeshiva University Behavioral Sciences Student Research Conference

Segal, L., and R. Freyberg, 2008, Social aspects of religious influence on youth, Yeshiva University Behavioral Sciences Student Research Conference

Silver, A., and R. Freyberg, 2008, Unfamiliar fragrances and their effects on nonverbal communication, Yeshiva University Behavioral Sciences Student Research Conference

Stiefel, E., and R. Freyberg, 2008, To co-sleep or separate sleep that is the question: Reasons and developmental effects of co-sleeping vs. separate sleeping, Yeshiva University Behavioral Sciences Student Research Conference

Bacon, J., Fromm, J.T., **Adelman, M., Neuhaus, R**., and J. Herbert, 2007, Targeted cognitive interventions improve cognitive functioning in patients with MS. Int. J. MS Care. 9:P13.

Bacon J, Fromm J, **Neuhaus R**, and J. Herbert, 2007, Cognitive interventions to improve cognitive functioning in patients with multiple sclerosis, Mult. Scler. (Suppl 2). 13:S232.

Fromm, J.T., Bacon, J., **Adelman, M**., Steinberg, C., Weiss, B., Vendola, M., **Neuhaus, R**., Haus, J, Pham, V., Hawkins, A., Paul, T., and J. Herbert, 2007, Improving quality of life through participation in self-management interventions. Int. J. MS Care. 9: S41.

Fromm, J.T., Bacon, J., **Adelman, M**., Steinberg, C., and J. Herbert, 2007, Clutter management in MS: Integrated occupational therapy approach. Int. J. MS Care. 9: S40.

Balk, E. and T. DiLorenzo, 2007, Risk factors for attrition in intervention programs for conduct disorder, Yeshiva University Behavioral Sciences Student Research Conference.

Oxman, H. and T. DiLorenzo, 2007, Associating word meaning to their ink color in an adaptation of the Stroop Effect, Yeshiva University Behavioral Sciences Student Research Conference

Seidenwar, L. and T. DiLorenzo, 2007, The effects of ADHD on parental functioning, Yeshiva University Behavioral Sciences Student Research Conference.

Weiser, A. and R. Freyberg, 2007, The interplay between self-esteem, marital satisfaction, and perceived peer rejection in middle adulthood, Yeshiva UniversityBehavioral Sciences Student Research Conference

Krupka, C.B., and R. Freyberg, 2007, The impact of Judaism and SES on substance use, Yeshiva University Behavioral Sciences Student Research Conference

Glaser, E., and R. Freyberg, 2007, The effects of religious service attendance on well-being, Yeshiva University Behavioral Sciences Student Research Conference

Bensoussan, M., and R. Freyberg, 2007, The nature of fragrance preferences in young women, National Meeting of the Association of Chemoreception Sciences, Sarasota, FL.

Bensoussan, M. and R. Freyberg, 2007, The nature of fragrance preferences in young women. Chem. Senses. 32:A115.

Zimmerman, R. and R. Freyberg, 2007, Effects of Ken Doll on body image of preadolescent males, Yeshiva University Behavioral Sciences Student Research Conference

Marmor, R.A., Fathy, J., Vigodner, M., and J.H. Weisburg, 2007, Differential expression pattern of SUMO proteins in normal and drug-resistant HL-60 cancer cell lines, Proceedings of the Columbia University Spring Undergraduate Research Symposium (poster presentation/abstract).

Guigui, S.A., Estes, D., and L. Blau, 2007, DNA's stability: composition vs. sequence, 233rd American Chemical Society National Meeting, Chicago, IL. (poster presentation/abstract).

Bursky-Tammam, N., **Platt, Y., Bram, A., Kanner, L., Simpser, M**., Zhou, J., Zhao, S., Rafailovich, M., and A. Frenkel, 2007, EXAFS analysis of hydrogenation effects on the structure of Pd nanacatalysts, 233rd American Chemical Society National Meeting, Chicago, IL. (poster presentation/abstract).

Brodt, N., Yamnik, R.L., Blenis, J., and M.K. Holz, 2007, Increased S6K1 protein expression confers proliferative advantage and rapamycin sensitivity to human mammary cancer cells, 233rd American Chemical Society National Meeting, Chicago, IL. (poster presentation/abstract).

Eisner, R., Schonbrun, C., Huang, N., and C. Rapp, 2007, Force field based receptor ligand rescoring, Mid-Atlantic Regional Meeting of the American Chemical Society (poster presentation/abstract).

Frenkel, A.I., Menard, L.D., Northrup, P., Rodriquez, J.A., Zypman, F., **Glasner**, **D**.,Gao, S.-P., Xu, H., Yang, J.C., and R.G. Nuzzo, 2006, Geometry and charge state of mixed-ligand Au13 nanoclusters , XAFS XIII Conference, Stanford, CA.

Bacon, J., **Riber, L**., Fromm, J.T., **Safier, M**., and J. Herbert, 2006, Motivational style as a predictor of adherence to injection therapy for multiple sclerosis. Mult. Scl. (Suppl 1) 12:S117.

Weller, I. and R. Freyberg, 2006, Application of a learning theory framework on to improving self-esteem and treatment outcomes of substance use disorders, Yeshiva University Behavioral Sciences Student Research Conference

Etengoff, C., and R. Freyberg, 2006, Judeo-Christian values and the female body image, Yeshiva University Behavioral Sciences Student Research Conference

Bensoussan, M., and R. Freyberg, 2006, Understanding fragrance preferences in young women.Yeshiva University Behavioral Sciences Student Research Conference

Glasner, D., and A.I. Frenkel, 2006, Geometrical characteristics of regular polyhedra: Application to EXAFS studies of nanoclusters, XAFS 13 Conference, Stanford, CA.

Ackerman, R., Weiss, T., and T. DiLorenzo, 2006, CBT: Modification of dating habits: A case study, Yeshiva University Behavioral Sciences Student Research Conference.

Dickstein, D. and T. DiLorenzo, 2006, Relationship status as a predictor of caregiver burden in traumatic brain injury, Yeshiva University Behavioral Sciences Student Research Conference.

Goldmintz, E. and T. DiLorenzo, 2006, Risk factors for maladjustment in children from divorced families, Yeshiva University Behavioral Sciences Student Research Conference.

Harris, T., Soussan, **L.,** Isseroff, R., Sun, Y., Rafailovich, M.H., and A.I. Frenkel, 2006, EXAFS studies of palladium nanoparticles: Size control and hydrogenation, XAFS13 Conference, Stanford, CA.

Pease, D.M., Frenkel, A.I., Shanthakumar, P., Huang, T., Balasubramanian, M., Budnick, J.I., Brewe, D., **Abitbol**, **N.**, and O. Odom, 2006, Performance and improved design of the log spiral of revolution monochromator, XAFS13 Conference, Stanford, CA.

Frenkel, A.I., Pease, D.M., Budnick, J., Shanthakumar, P., Huang, T., **Abitbol**, **N**., and P. Metcalf, 2006, X-Ray Absorption Fine Structure study of the metal-insulator transition in Cr doped V2O3, March Meeting of the American Physical Society, Baltimore, MD.

Sun, Y., Frenkel, A.I., Isseroff, R., **Shonbrun**, **C.,** Forman, M., Shin, K., Koga, T., White, H., Rafailovich, M., and J. Sokolov, 2006, Characterization of Palladium and Gold nanoparticles using x-ray reflectivity, EXAFS and electron microscopy, March Meeting of the American Physical Society, Baltimore, MD.

Zaghi, D., Jacobson. M., and G. Barreiro, 2006, pH Sensitivity in talin, 232nd National Meeting of the American Chemical Society, San Francisco, CA

Feig, J.L., Ha, S., Rudoff, R., and S.K. Logan, 2006, ART-27: a novel coactivator with tumor suppressor function in the prostate, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Fridman, F., Erika, A., Ringia, T., and V.L. Schramm, 2006, Inhibitor screening for human nucleoside phosphorylase, bovine xanthine oxidase, and *E. coli* thymidine phosphorylase, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Goldberg, M.S., Gerke, J.P., and Cohen, B.A., 2006, Correlation of gene expression and sporulation efficiency in *Saccharomyces cerevisiae*, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Levine, E., Mandell, D., Jacobson, M.P., and C.S. Rapp, 2006, An implicit solvent study of phosphorylation in protein molecules, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Soussan, L.L., **Harris, T., Isseroff, R.,** Sun, Y., Rafailovich, M., and A.I. Frenkel, 2006, Thiol-stabolized palladium nanoparticles: size control and hydrogenation, 231st National Meeting of the American Chemical Society, Atlanta, GA.

Estes, D.W, **Ben-Zvi, N.,** and L. Blau, 2006, The DNA melt, 19th Biennial Conference on Chemical Education, West Lafayette, IN, July.

Edelblum, R. and T. DiLorenzo, 2005, Aging: Natural buffer against the effects of multiple sclerosis, Yeshiva University Behavioral Sciences Student Research Conference.

Galian, L. and T. DiLorenzo, 2005, Pain and gender: The underlying difference, Yeshiva University Behavioral Sciences Student Research Conference.

Sweet, R. and T. DiLorenzo, 2005, Sociotropic cognitions and levels of spirituality, Yeshiva University Behavioral Sciences Student Research Conference.

Estes, D.W., **Ben-Zvi, N.,** and L. Blau, 2005, The DNA melt: Composition, sequence, and thermodynamics, Gordon Research Conference on Chemistry

Education Research and Practice, Connecticut College, New London, CT, June.

Frenkel, A.I.,Pease, D.M., Shanthakumar, P., Huang, T., **Abitbol**, **N**., **Soussan**, **L**., and J. I. Budnick, 2005, X-ray absorption fine structure study of the metal-insulator transition in Cr doped V2O3, Fall Meeting of the Materials Research Society, Boston, MA

Sun, Y., Isseroff, R., **Shonbrun**, **C**., Forman, M., Frenkel, A.I., Shin, K., Koga, T., White, H., Rafailovich, M.H., and J.C. Sokolov , 2005, Characterization of palladium nanoparticles using x-ray reflectivity, EXAFS and electron microscopy, Fall Meeting of the Materials Research Society, Boston, MA

Nissim, H.A., **Krupka, M.E**., Zuckerbraun, H.L., and H. Babich, 2005, Differential *in vitro* cytotoxicity of (-)-epicatechin gallate to cancer and normal cells from the human oral cavity, 229th National Meeting of the American Chemical Society, San Diego, CA.

Roth, R., Ozelius, L., and L. Liu, 2005, Explanation of alternative splicing in SGCE gene, 229th National Meeting of the American Chemical Society, San Diego, CA.

Nemzer, S., **Harris, T**., **Pister, I**., **Soussan, L**., Sun, Y., Rafailovich, M., and A. Frenkel, 2005, Characterizing nanoparticle size using EXAFS and TEM, 229th National Meeting of the American Chemical Society, San Diego, CA.

Nemzer, S., **Harris, T**., **Pister, I**., **Soussan, L**., Sun, Y., Rafailovich, M., and A.I. Frenkel, 2005, Size control of thiol-stabilized gold nanoparticles: combined EXAFS and TEM characterization, 229th National Meeting of the American Chemical Society, San Diego, CA.

Pister, I., Soussan, L., Nemzer, S., Harris, T., Frenkel, A.I., Sun, Y., and M.H. Rafailovich, 2005, Size dependent changes of the local structure in dodecanethiol-stabilized gold nanoparticles, Annual Meeting of the American Physical Society, Los Angeles, March (oral presentation).

Goldmintz, Y., and T. DiLorenzo, 2004, Efficacy of selective serotonin reuptake inhibitors vs. tricyclic antidepressants in elderly melancholic depressed, Yeshiva University Behavioral Sciences Student Research Conference.

Wiesen, T., and T. DiLorenzo, 2004, Somatization in Dominican individuals, Yeshiva University Behavioral Sciences Student Research Conference.

Wright, N. and T. DiLorenzo, 2004, Social influence on women and heart disease: Perceived risk and preventive health behaviors, Yeshiva University Behavioral Sciences Student Research Conference.

Ben-Zvi, N., Juszczak, L. and J. Friedman, 2004, Unfolding and refolding of the mini-protein TC5b in a confined, cell-like environment, 227th National Meeting of the American Chemical Society, Anaheim, CA.

Douglas, E., Ravetch, J.V. and B. Diamond, 2004, Fcγ receptor expression on peripheral blood mononuclear cells in SLE, 227th National Meeting of the American Chemical Society, Anaheim, CA.

Glasner, D., Frenkel, A.I, and F.R. Zypman, 2004, Geometrical properties of metal nanoparticles, 227th National Meeting of the American Chemical Society, Anaheim, CA.

Suttner, S., Sukhu, B., and H.C. Tenenbaum, 2004, Effect of the inflammatory cytokine (IL)-1β on osteoclast formation and function in human umbilical cord blood cells, 228th National Meeting of the American Chemical Society, Philadelphia, PA

Reinman, I., **Benmergui, D**., and C.S. Rapp, 2004, Theoretical investigation of ligand stabilization in fatty acid binding proteins, 228th National Meeting of the American Chemical Society, Philadelphia, PA

Glasner, D., Zypman, F., and A.I. Frenkel, 2004, Geometric properties of metal nanoparticles, Annual NSLS Users Meeting, Brookhaven National Laboratory, May.

Frenkel, A.I., **Glasner, D.,** Zypman, F., Nuzzo, R., and L. Menard, 2004, 3D-structure of thiol-capped gold nanoparticles, Annual Meeting of the American Physical Society, Montreal, Canada.

Reingold, S.O., Gu, J., Fernandez, R. and R.L. Katz, 2003, Interphase fluorescence *in situ* hybridization (FISH) to demonstrate translocation of cyclin D1 (CCD1) gene to chromosome 14 immunoglobulin heavy chain locus (IGH) with resultant overexpression of cyclin D1 protein in a mantle cell lymphoma cell line, 225th National Meeting of the American Chemical Society, New Orleans, LA

Sedletcaia, A. and P. Cohen, 2003, Localization of PMS2 in meiotic cells, 225th National Meeting of the American Chemical Society, New Orleans, LA.

Josovitz, J., Verdier-Pinanrd, P. and S. B. Horwitz, 2003, Analysis of stathmin and MAP- 4 content in taxol resistant cell lines, 225th National Meeting of the American Chemical Society, New Orleans, LA.

Gamss, C.A., Ting, L.-M., and K. Kim, 2003, Inhibition of the purine salvage pathway in *Plasmodium falciparum*, 226th National Meeting of the American Chemical Society, New York, NY.

Frankel, R., Fischer, T. and C.S. Rapp, 2003, The effects of crystal packing on protein loop structures, 36th Middle Atlantic Regional Meeting of the American Chemical Society, Princeton, NJ

Frenkel,A.I., **Frankel, S.C.,** and T. Liu, 2003, Structural stability of giant polyoxomolybdate molecules as probed by EXAFS. XAFS XII Conference, Malmo, Sweden.

DiLorenzo, T, Erblich, J, Montgomery, G, **Ephron, R, Shaffren, M** and Bovbjerg, D, 2002, Family histories of disease and disease-specific worry: The role of perceived risk.National Meeting of the Society of Behavioral Medicine Annual Meeting, Washington, D.C.

Frankel, S.C , and A. Frenkel, 2002, Reduction of nickel oxide with hydrogen from local perspective, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Kenigsberg, B., Kaufman, H. and R. Glover, 2002, Immune responses to recombinant BCG expressing carcinoembryonic antigen, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Kenigsberg, B., Sedletcaia, A., Estes, D. and L. Blau, 2002, Twenty years of bonding; the Chemistry club and the ACS, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Nivasch, R., Chill, J. and J. Anglister, 2002, NMR-based homology model of the interferon α receptor, 2002, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Sedletcaia, A., Kenigsberg, B. and H. Babich, 2002, *In vitro* cytotoxicity of protocatechuic acid, an inducer of oxidative stress, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Sedletcaia, E. Matthiesen, S.H. and B.H. Sator, 2002, Parafusion homologue in *Tetyrahymena thermophila*, 223rd National Meeting of the American Chemical Society, Orlando, FL.

Frankel, S.L. and D.R. Maglot, 2001, LOCUSLINK and REFSEQ: Developing tools for genomic annotation and analysis, 221st National Meeting of the American Chemical Society, SanDiego, CA.

DiLorenzo, T, Halper, J, Piccone, MA and **A**. **Lasky,** 2001, Aging with multiple sclerosis: A preliminary investigation. National Consortium of Multiple Sclerosis Centers, Ft. Worth, TX.

Rivkin, S.Y., Oh, S. and T.A. Bargiello, 2001, Determinants of Vj gating polarity in connexin 32 hemichannels, 221st National Meeting of the American Chemical Society, San Diego, CA.
Goldfischer, R.E., Wencker, D., and R. Kitsis, 2000, Myocyte apoptosis is sufficient to cause cardiomyopathy, 219th National Meeting of the American Chemical Society, San Francisco, CA.

Marton, D., Kang, Y.H., and F. Berthiaume, 2000, Chronic exposure to cytokines suppresses liver-specific function of cultured hepatocytes, 219th National Meeting of the American Chemical Society, San Francisco, CA.

Badrian, C.C., Haspel, J., Friedlander, D., and M. Grumet, 1999, Promotion of neurite outgrowth by regions in human L1, 217th National Meeting of the American Chemical Society, Anaheim, CA.

Blau, L., Babich, H., Zuckerbraun, H.L. and **S.T. Hirsch**, 1999, *In vitro* cytotoxicity of the nitric oxide donor, *S*-nitroso-*N*-acetyl-penicillamine, towards cells from human oral tissue, 217th National Meeting of the American Chemical Society, Anaheim, CA.

Feig, J.S., Cleary, J., and B. Diamond, 1999, Detection of estrogen receptor α mRNA in B and T cell lines by reverse transcriptase chain reaction, 217th National Meeting of the American Chemical Society, Anaheim, CA.

Babich, H. and **S.H. Goldstein**, 1988, Bioassays for monitoring the environment: study with arsenics, 9th Annual Meeting, Society of Environmental Toxicology and Chemistry, Arlington, VA.

Ambalu, M. and L. Blau, 1986, The study of ion fluxes across lipid bilayers, 191st National Meeting of the American Chemical Society-7th Student Affiliates Research Symposium, NY, NY.

Gutman, E.A. and L. Blau, 1985, X537A-mediated transport of calcium across phosphatidylcholine bilayers, 189th National Meeting of the American Chemical Society - 6th student Affiliates Research Symposium, Miami Beach, FL [E.A. Gutman was awarded 1st prize, Biochemistry Section].

Blau, L., **Stern R.B**., Wun, T.C., and R. Bittman, 1984, Calcium transport across phosphatidylcholine vesicles, 8th International Biphysics Congress, Bristol. United Kingdom.

Student Presentations at the National Conference of Undergraduate Research

1998: **Malka Skiba** and **Cheryl Younger**
1995: **Lauren Insel** and **Judy Ehrenberg**
1994: **Yaffa Cheslow**, **Debbie Friedman**, and **Stacey Tuckman**

Derech HaTeva, a Journal of Torah and Science

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WOMEN IN SCIENCE: ABSTRACT BOOKLET

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Effect of L-arginine on the Appetitive Behavior of Hungry Rats

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Obesity is one of the most serious issues plaguing the global community today, posing far-reaching consequences to public health. Obesity results from overconsumption and reduced energy expenditure, which induce an imbalance in homeostatic energy. A deeper understanding of energy balance regulation, therefore, is critical to treating and preventing obesity.

Nitric Oxide (NO) is a naturally-released gaseous molecule found in most living organisms and spanning a wide variety of functions in the body, including vasodilation and food regulation. L-arginine, a dietary amino acid, is the substrate for synthesis of NO in the body and in the brain. Recent studies in the marine slug *Aplysia* and in mammals indicate that NO, under conditions of satiation and low motivation to eat, is a weak inhibitor of feeding. In contrast, research in *Aplysia* further shows that under conditions of high motivation to eat, NO increases appetitive behavior. There have not yet been studies investigating the consumatory impact of L-arginine in mammals under conditions of high motivation to eat.

The objective of this study is to investigate the effect of NO on feeding in adult male rats under conditions of high motivation to eat. Based on research in *Aplysia*, we hypothesize that animals that have been injected with L-arginine, a substance that increases the production of NO, will show increased appetitive behavior, or at least will not show decreased feeding, compared to controls.

To ensure the condition of high motivation to eat, the animals were made to be hungry at the start of the experiment by providing them with only 60% of their normal chow consumption the previous night. At the start of the experiment, the hungry animals received an intra-peritoneal injection of either L-arginine in saline (N=4) or a vehicle treatment (saline, N=4). The dosage administered to the animals was 150 mg/kg. After a 5-minute recovery period, the animals were returned to their individual experimental cages with free access to 20 grams of chow. Their appetitive behavior was observed and recorded for 1 hour. Appetitive behavior was defined as approaching, sniffing, and/or eating the chow.

The results of the study show that the mean number of meals in the control group was slightly less than that of the experimental L-arginine group. On average, the control group exceeded the L-arginine experimental group in duration of animals' first meals, time spent eating, total time of appetitive

behavior, total grams of chow consumed, bout length, and bout size. However, when the data from the study were analyzed using several two-tailed independent t-tests, $p<.05$, it is evident that the differences in feeding between the control group and the experimental L-arginine group are not significant. Note the relatively small N per group. The trend in the data seems to indicate that the administration of L-arginine and increased production of NO reduces appetitive behavior in hungry rats. Further experimentation on additional subjects is necessary to ascertain whether this trend of L-arginine-induced decreased feeding in hungry animals is indicative of a significant effect. It is clear, however, that administration of this dose of L-arginine under conditions of high motivation to eat does not increase appetitive behavior in adult male rats.

The Long-term Effects of Kangaroo Care on the Development of Premature Infants

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Previous studies have demonstrated that premature birth can have deleterious effects on child development such as lower academic, cognitive and emotional abilities.[1] Additionally, past studies have found lower amounts of white matter in the brains of premature births and have suggested that this decrease may lead to many of the cognitive dysfunctions found in children born prematurely.[2]

A common intervention to combat these adverse effects is skin-to-skin contact, or kangaroo care. Though previous studies have researched the immediate positive effects of kangaroo care, as of now no studies have looked at the long-term effects kangaroo care has on the future development of the child. Researching this is important in that it will further the present knowledge on kangaroo care and possibly instigate the conception of future interventions to reduce the negative effects of premature birth.

Our current longitudinal study is researching the long-term effects kangaroo care has on the development of premature babies. Participants were 146 premature babies born in Israeli hospitals between December 1996 and September 1998. The participants were randomly distributed into two groups of 73 each; one group received kangaroo care while the other received customary NICU treatment. Participants were visited seven times throughout their childhood and were given a series of tests with which to assess different cognitive abilities. The most recent study showed that receiving kangaroo care can have positive effects later in life; participants at age ten showed a decreased response to stress, superior cognitive control and autonomic functioning, and a more mutual mother-child rapport.[3]

Participants are presently being visited again at age 18 to evaluate the effects in adults who have had neonatal kangaroo care. Using questionnaires, saliva samples, in-person interactions, and magnetic imaging methods such as functional MRI and diffusion tensor imaging, researchers are studying and comparing brain activity, anxiety, depression, attachment, empathy, and synchrony in the two participant groups. Additionally, this study will combine both the behavioral and neurological tests to see if kangaroo care has an effect on either.

It is hypothesized based on past research that the kangaroo care group will have significantly lower anxiety and depression levels and higher attachment, empathy and synchrony scores as compared to the control group. Additionally, it is hypothesized that the brain activity in the kangaroo group

will show higher axial diffusion and lower radial diffusion levels, leading to the conclusion that the kangaroo care group has a positive effect on white matter integrity.

Though there are no significant results as of yet as researchers are still collecting and analyzing the data, the data that has been analyzed seems promising in support of the hypotheses.

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The Relationship Between TRF2 and Various Basal Transcription Factors in Transcription Regulation

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The core promoter is a regulatory element in the transcription process of the eukaryotic cell that varies both in structure and function, depending on the gene. Transcription can be initiated in one of two ways: focused and dispersed. Focused initiation occurs in a localized region of the core promoter, either at a single nucleotide or in a small group of nucleotides, whereas dispersed initiation involves a few weaker transcription start sites that are found within a 50-100-nucleotide range. Although simpler organisms usually undergo focused transcription initiation and most vertebrate cells undergo dispersed transcription initiation, a small yet important group of vertebrate genes still undergo focused transcription initiation. The structure of the focused core promoter varies significantly depending on the absence and/or presence of specific sequence motifs like the TATA box, DPE (Downstream core Promoter Element) etc. (Figure 1).

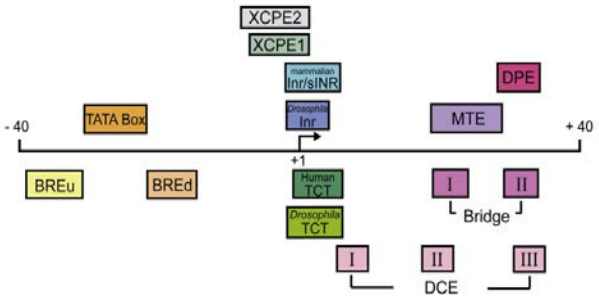

Figure 1: Schematic illustration of the most common core promoter elements found in focused promoters.

In order to facilitate gene expression, components of the basal transcription machinery recognize and bind to the core promoter, and subsequently recruit RNA Polymerase II to the transcription site in order to facilitate gene expression. These basal transcription components are called TFIIA, TFIIB, TFIID, TFIIE, TFIIF, and TFIIH (Figure 2).

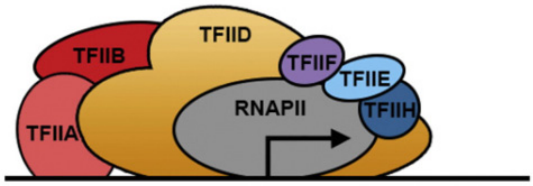

Figure 2: The assembly of the basal transcription machinery on the core promoter (Arrow represents core promoter).

The first basal transcription factor that is responsible for recognizing and binding to the core promoter is TFIID, a complex of TBP (TATA Binding Protein) and various TAFs (TBP Associated Factors). TBP activates TATA box dependent transcription and represses DPE dependent transcription, thus regulating TATA dependent versus DPE dependent transcription. The TAFs that surround TBP aid in regulation of the transcription initiation and gene expression (Figure 3).

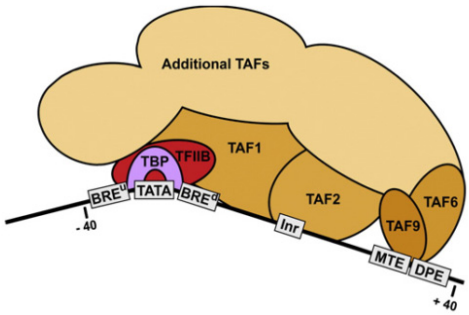

Figure 3: Zooming in on the DNA-binding PIC components (TFIIB and TFIID).

Transcription is regulated by assorted core promoter elements and basal transcription machinery. A good example of such assortment is the existence of three types of TBP-related factors (TRFs): TRF1, TRF2, and TRF3.

The family of TRF proteins shows high homology to the C terminal core domain of TBP. The structure of the TBP C terminal domain allows it to interact with the TATA-box. TBP, TRF1 and TRF3 can activate TATA box dependent transcription. However, of the three types of TRF (TRF 1, 2, and 3) TRF2 is the least similar to TBP and thus cannot interact with the TATA-box. Since TRF2 lacks the amino acid construct that is required for TATA box binding, it therefore does not bind to the TATA box in the core promoter. Instead, it activates DPE and other types of TATA-less promoter dependent transcription as opposed to TATA box dependent transcription, and is thus involved in the regulation of different genes from TBP.

Consequently, there is reason to believe that like TBP, TRF2 warrants its own complex, comprising of an entirely unique composition of TAFs and other transcription factors.

The focus of this study is to determine which other transcription factors work in tandem with TRF2 and to explore the possibility of unique TRF2 gene expression (i.e. genes that cannot otherwise be expressed in the TBP/TFIID complex). Through the process of immunoprecipitation, it was thus far determined that TRF2 works with TAF1, TAF4, and TAF6. Over the course of several weeks, TAF1, TAF4, and TAF6 genes as well as PET15b, PET 29, and pFastBac plasmid vectors were cloned and sequenced by PCR. The long-term goal is to study gene expression regulation, specifically the expression of the various TAF proteins in conjunction with TRF2 in bacterial cells. This will be done by inserting each of the TAF proteins into each of the vectors and then transferring the vector-insert complex into bacterial cells, which will in turn produce proteins. These proteins will be extracted, purified, and subjected to *in vitro* transcription. The products of this *in vitro* transcription – RNA which code for various proteins – will shed light on which of the other proteins are indeed necessary in TRF2 initiated transcription.

The Effect of G Protein Coupled Receptor TGR5 Activation on Diabetic and Obesity Related Kidney Disease

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Obesity, diabetes, and insulin resistance are main contributers of increased renal disease.[1] This is especially concerning given that the prevalence of obesity and insulin resistance is steadily rising. In fact, the results of a recent study indicate that obesity will increase 33% and that severe obesity will increase 130% by 2030.[2] Many overweight or obese adolescents in the US are at high risk of contracting renal, hepatic, and cardiovascular diseases, along with diabetes. Even when patients are treated for diabetes or insulin resistance, although the benefits are tremendous, renal disease can and does continue to develop. Additional treatment is necessary to slow and prevent the deterioration of renal function in obese or diabetic patients.

The G Protein Coupled Receptor TGR5, which is activated by bile acids, has been shown to have positive effects on muscle, brown adipose tissue, and enteroendocrine cells. TGR5 is decreased in the kidneys of human patients and mouse models with obesity and diabetes, but the effect of TGR5 on the kidney in not known. The purpose of this current study is to determine how the activation of G Protein Coupled Receptor TGR5 with the selective agonist INT-777 can be used for the prevention and treatment of kidney disease in mouse models of diabetes and obesity.

To investigate the effects of TGR5, two groups of mouse models were studied. The first group, db/m and db/db diabetic mice, was either fed a regular diet or a diet supplemented with TGR5 agonist INT-777. The second group, C57BL/6J diet induced obesity mice, was either fed a low fat diet, or a high fat diet with or without added TGR5 agonist INT-777. At the end of treatment, urine was collected for measurement of urine albumin excretion, the mice were then anesthetized, blood was obtained, and their kidneys were harvested and then processed for histopathological stains and microscopy, RNA extraction and real-time qPCR, lipid extraction and lipid composition analysis, and protein extraction and western blotting.

Study of the mice models' kidneys revealed that in mice with untreated obesity and diabetes, inflammation, oxidative stress, and lipids are increased in the kidney, resulting in kidney fibrosis. Lipid accumulation in the kidney is shown in **Figure 1** with Coherent Anti-Stokes Raman Scattering (CARS) Microscopy. Treatment with the TGR5 agonist INT-777 decreased urinary albumin excretion and prevented inflammation, oxidative stress, lipid accumulation, and fibrosis. The effect the treatment had on collagen IV, a

protein associated with fibrosis, can be seen in **Figure 2**. Treatment with TGR5 agonist INT-777 led to increased AMPK, SIRT1, PGC-1α, SIRT3, and ERRα protein abundance, also increasing mitochondrial biogenesis, energy expenditure, fatty acid oxidation, and mitochondrial antioxidant generation.

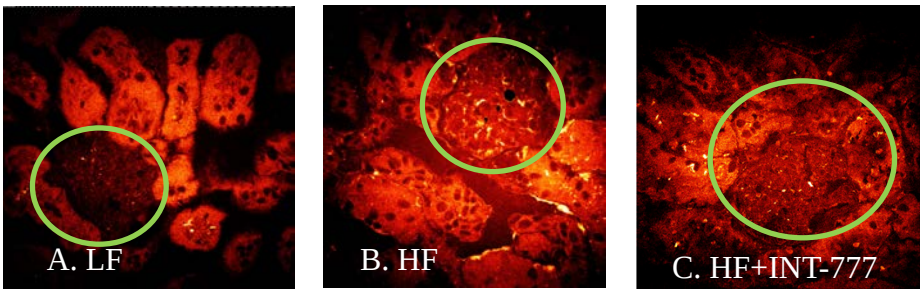

Figure 1: CARS imaging of (A) kidney in a mouse model fed a low fat diet. There are hardly any lipids in the glomerulus. (B) kidney in a diet induced obesity mouse model fed a high fat diet. The lipid deposits (bright areas) in the glomerulus are clearly visible. (C) kidney in an high fat mouse model receiving INT-777. Lipids in the glomerulus are reduced.

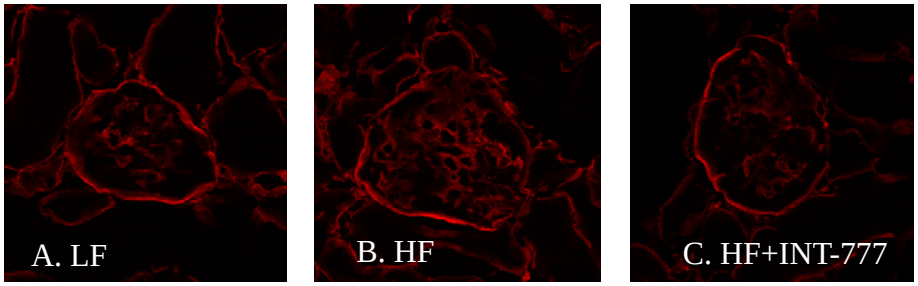

Figure 2: Immunofluorescence expression of collagen IV. (A) mouse model fed a low fat diet exhibits normal collagen IV signal in the glomerulus of the kidney. (B) diet induced obesity mouse model fed a high fat diet exhibits a high signal. (C) mouse model fed a high fat diet with supplemented TGR5 activator INT-77 shows a reduced signal.

TGR5 activation significantly reduced renal complications in diabetes and obesity, while increasing metabolic function. Due to TGR5's far reaching effect, it is an important progression in the prevention and treatment of renal disease in patients with obesity and diabetes.

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The Effects of Femoral Fractures on Morbidity and Mortality in Elderly Individuals

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Femoral fractures are common injuries sustained by the elderly who are at a higher risk for osteoporosis. Osteoporosis is a progressive bone disease that weakens bones and makes them susceptible to bone fractures. The expected increase in population growth of elderly individuals will result in a higher number of femoral factures. This study investigates the effects of femoral fractures on morbidity and mortality. A chart review of Medical Examiner Cases identified twenty-four elderly patients with femoral fracture. Ages ranged from 70 to 100 years. Factors taken into account include gender, age, co-morbidities, surgical intervention and social factors that could potentially increase the risk of mortality in this elderly population.

The results of this study show that 58% (14 out of 24) of individuals with femoral fracture were female. The death was certified primarily as femoral fracture due to blunt impact of hip in 88% (21 out of 24). 8% (2 out of 24) died from additional co-morbid conditions including hypertensive and arteriosclerotic cardiovascular disease, diabetes mellitus and obesity. One individual in this study, who sustained a femoral fracture died from natural disease, unrelated to the injury. 48% (11 of 23) of individuals undergoing surgical repair of femoral fracture died within one week of surgery; 39% (9 of 23) died within one week to one month. One patient refused surgery. Most of the individuals, 88% (21 of 24) reported the injury occurred in their home. 12% (3 of 24) of cases reported the injury occurred in a hospital or nursing home setting or outside.

Our results support existing studies on the topic of femoral fracture as it relates to morbidity and mortality. Our findings show that women are more likely than men to suffer from femoral fracture. This is most likely due to the fact that women are more prone to developing osteoporosis in advanced age. Our findings demonstrate that the presence of co-morbid conditions, namely chronic natural disease, frequently result in an increased risk of mortality among the elderly. The study also shows that the most frequent place of injury in our elderly population is the home, which may suggest that the home needs to be adapted for additional safety measures to prevent such incidents. Another vital social aspect to be considered is the survival of femoral fracture following hip surgery. Our findings suggest that elderly individuals who are in constant care and supervision during the first few postoperative days could potentially have greater chances of survival.

The limitations of this study include the small number of cases, the lack of a control group, and the inability to obtain adequate clinical and social history.

Further studies are needed to document natural disease, other co-morbid conditions and social circumstances that impact morbidity and mortality in an elderly population.

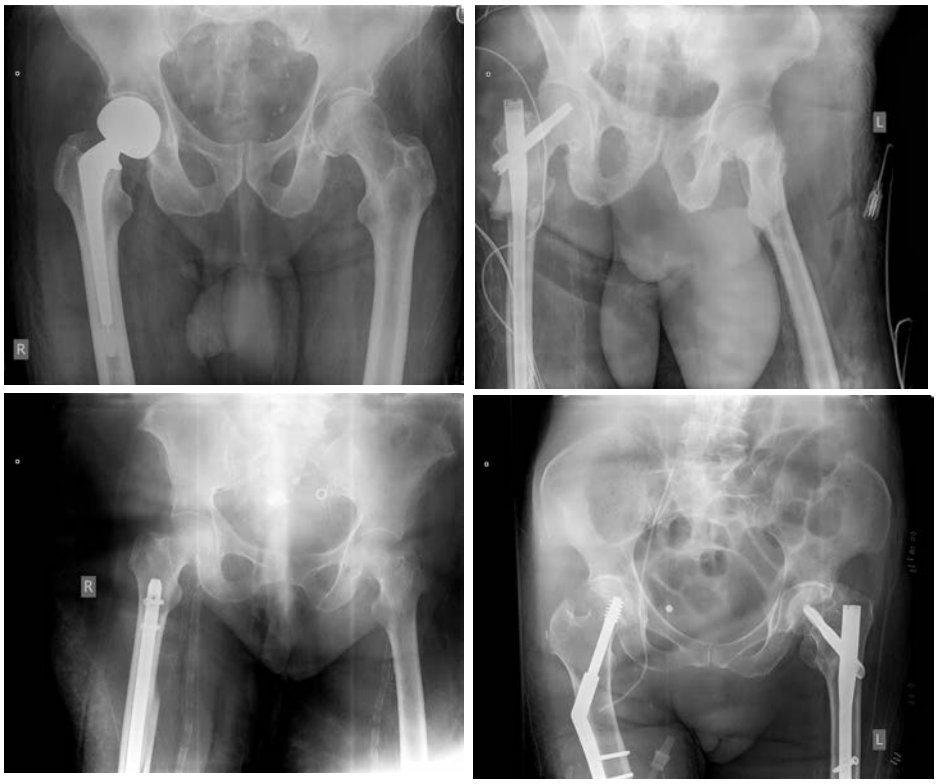

Fig. 1: X-rays taken from four patients with femoral fracture and subsequent surgical repair.

Using the CDKN2A Gene to Find Germline Determinants of Familial Melanoma

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Although cutaneous melanoma only accounts for less than 5% of skin cancers, it is responsible for approximately 75% of skin cancer-related deaths worldwide. Cutaneous melanoma results from the malignant transformation of melanocytes, or the pigment-producing cells responsible for skin color. Key triggers that lead to the transformation of these melanocytes include UV radiation and genetic susceptibility.[1]

About 10% of melanoma cases are familial, or caused by inherited gene mutations.[2] Mutations to the cell division regulator gene CDKN2A are most common, though mutations to this high-risk melanoma gene only explain a minute percentage of familial melanoma cases. Therefore, other unidentified mutations must be involved. Our study sequenced the coding region of the CDKN2A gene (4 exons) in familial melanoma patients looking to identify rare variants or to determine that there are no mutations in this gene. If there were no mutations, we looked to find other germ line determinants that could have been responsible.

The study utilized a collection of 152 saliva samples obtained from familial melanoma patients. The samples were first purified to isolate the individual's DNA from proteins and other contaminants in the saliva. The samples, eluted in TE buffer, were then left to incubate at room temperature overnight. To quantify the nucleic acid concentration and to determine the purity of the DNA samples, the samples were then nanodropped using TE buffer as a blank.

A picogreen assay and a gel electrophoresis were then performed, further quantifying the DNA samples and ensuring purity. The picogreen assay measures the nucleic acid concentration in a sample using its absorbance at a wavelength of 260 nm. In gel electrophoresis, a fluorescent dye was added to each DNA sample, making them appear as bright bands on the gel and adding a visual check of DNA quality. All three methods of quantifying DNA and determining DNA purity were compared to confirm that they were consistent with each other.

Finally, the samples were aliquoted and sent for Sanger sequencing. So far analysis has been done on the 3 exons that code for CDKN2A and has shown no mutations to be present. The analysis of the 4th alternate splicing exon is still ongoing. After this analysis is complete, further techniques such as Whole Genome Sequencing (WGS) will be performed to find other genetic variations that are responsible for melanoma in CDKN2A wild type patients.

A particular focus of this analysis is to elucidate the structure of the relatively unexplored non-coding regions of the genome.

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Procoagulant Platelets in Thrombi

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Background: Current clinical platelet function tests used for diagnosing bleeding disorders are limited as to what they test for; therefore they fail to identify a defect in many patients with clinically significant bleeding. Without a diagnosis, it is hard for these patients to get the specific treatment they need. Clinical tests don't measure the presence of procoagulant platelets, a subpopulation of platelets that maintain a higher quantity of procoagulant proteins on their surface. The increase in procoagulant proteins leads to an increase in thrombin formation, which up-regulates clot formation and provides stability.[1] Fewer procoagulant platelets may be a potential cause of bleeding in these patients.

Procoagulant platelets have high levels of phosphatidylserine (PS) on their surface compared to non-activated and activated platelets. Additionally, glycoprotein (GP) IIbIIIa, which binds fibrinogen in its active conformation, reverts back to its inactive state. These procoagulant platelets are only formed as a result of strong stimulation by multiple activators. *In vitro*, in the presence of thrombin or convulxin (a collagen mimetic) alone, there are few procoagulant platelets formed. However, using thrombin and convulxin together is sufficient to stimulate the conversion of activated platelets to procoagulant platelets. Flow cytometry can be used to identify the presence of PS and activated GPIIbIIIa (a-GPIIbIIIa); procoagulant platelets are PS positive and a-GPIIbIIIa negative, whereas activated platelets are PS negative and a-GPIIbIIIa positive. While flow cytometry can quantify these platelets, in order to understand their role in thrombus formation under physiologic conditions, a microfluidic perfusion assay can be used to see procoagulant platelets and non-procoagulant platelets within formed thrombi.

Aim: Develop an assay for flow cytometry that will quantify procoagulant platelets in human blood, and use a microfluidic perfusion assay to visualize procoagulant platelets within formed thrombi.

Materials and Methods: Blood samples from healthy volunteers were drawn into 3.2% sodium citrate tubes. For flow cytometry, platelets were isolated from the whole blood and washed using standard techniques.[2] Platelets were activated using thrombin, which activates platelets via the PAR receptors, and/or convulxin, which activates platelets via the collagen receptor GPVI. Platelets were labeled with antibodies bound to fluorophores. PAC1-FITC was used to label a-GPIIbIIIa and Annexin-V-AF647 was used to label PS. For the microfluidic assay, platelets in the whole blood samples were labeled using a platelet-specific antibody bound to AF488. The blood

samples were run through collagen-coated microchannels at physiologic arterial shear rate for four minutes on the VenaFlux system. Annexin-V-AF647 was added after the flow ceased and still images were captured at both fluorophore wavelengths and the processed using ImageJ (NIH).

Results: The range of percent of procoagulant platelets in our study is similar to previously studies with a range from 9.5%-53.7% in samples activated by both thrombin and convulxin. Samples activated by thrombin or convulxin alone have significantly smaller procoagulant platelet populations of 2.1%±1.5% (mean±standard deviation) than dual-stimulated samples, which have 35.9%±15.6% ($P < 0.0001$) procoagulant platelets. Size and granularity in the procoagulant platelets is significantly lower than in activated platelets as measured by the forward and side scatter, respectively. The microfluidics perfusion assay demonstrated that most thrombi are a mix of activated and procoagulant platelets. However, the different platelet populations localize in different parts of the thrombus. The procoagulant platelets are on the outside of the thrombus, while non-procoagulant platelets make up the core.

Conclusions: The flow cytometry assay developed and tested using healthy adult blood was able to show a differentiation between procoagulant and non-procoagulant platelets. Thrombin and convulxin alone don't cause sufficient activation of the platelets for large quantities of procoagulant platelets to be formed. However, when the two agonists are combined, a larger population of procoagulant platelets is seen. Procoagulant platelets appear to be smaller and less granular than activated platelets. The microfluidic perfusion assay clearly identified the two platelet populations, with procoagulant platelets making a cap around the activated platelets. The assay developed for flow cytometry and the results from the microfluidic perfusion assay will serve as a foundation for research being done on patients with clinically significant bleeding due to an unknown defect.

(c)

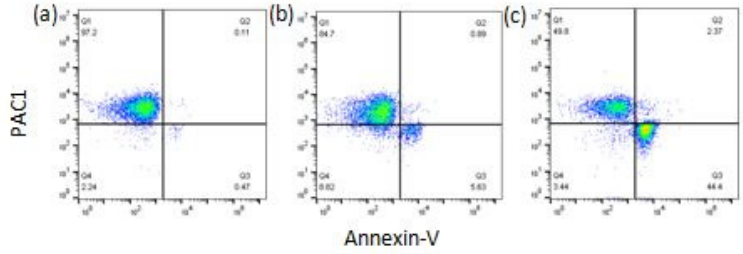

Figure 1: **Flow cytometry data distinguishing between activated and procoagulant platelet populations in response to stimulation by different agonists.** In samples a-c there are two distinct platelet populations, one of PAC1 positive, Annexin-V negative (activated platelets in Q1) and one of PAC1 negative, Annexin-V positive (procoagulant platelets in Q3). Additionally, in all three samples, there is less than a 3% dual-positive platelet population, further showing the two

distinct populations (activated and procoagulant). (a) thrombin-activated platelets (b) convulxin-activated platelets and (c) thrombin- and convulxin-activated platelets

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The Effect of Trait Binge Eating on the Conflict between Immediate Pleasure and Delayed Aversive Consequence: A Rat Eating Behavioral Model

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Decision making research often looks at a number of personality traits and conflict variables that influence the choices we make. One important conflict that is examined is the decision to choose an action that is immediately rewarding but has delayed negative consequences. Our lab aims to identify the biological basis and neural mechanisms that underlie such decisions. To do so, we use a behavioral model, in which rats are presented with the choice to consume highly palatable foods (PF) that are associated with delayed digestive discomfort. We chose to examine the impact of "trait binge" eating on the preference for PF under potentially aversive conditions.

Binge eating (BE) is a maladaptive eating pattern in which one rapidly consumes a larger than normal amount of food, and highly palatable foods are salient stimuli for binge eating. In our study, we examined whether the level of PF preference for Oreo cookies, accessible for a limited duration (4 hours, every 2-3 days), is affected by the expectation of a delayed negative digestive consequence (lactose-induced lower abdominal discomfort). Adult rats typically experience digestive discomfort as a result of lactose ingestion due to low levels of intestinal lactase activity. Because the negative digestive response does not immediately follow the intake of lactose, we attempted to produce a learned association of the abdominal discomfort with the PF, which the rats received in the study around the same time the abdominal discomfort appeared.

Binge eating prone (BEP) and binge eating resistant (BER) PF eating patterns in rats is an established paradigm that allows us to differentiate individuals with or without "trait BE." In the first stage of our study, 46 adult female Wistar rats were characterized and categorized into the two trait BE groups, BEP and BER, based on a series of 3 tests in which they were given Vanilla Ensure Plus, a nutritional substitute (and PF), to consume. Rats were ranked according to amount consumed in comparison to body weight on days 2 and 3, and rats that consumed more the median Ensure consumption were categorized as BEP.

We hypothesized that there would be a difference in PF consumption (binge size) between BEP and BER groups while tolerating the lactose-induced lower abdominal discomfort. Lactose ingestion, as compared with glucose ingestion, would be associated with a decrease in the consumption of PF, especially in the BER group. BEP lactose rats were expected to consume as much PF as the BEP glucose group, regardless of the lactose-induced lower

abdominal discomfort. The amount consumed by the BEP lactose group was also expected to be greater than the amount consumed by the BER lactose group.

During the second stage of the experiment, both BEP and BER rats were conditioned to anticipate the PF. To accomplish this, rats were given a solution of glucose mixed with Ensure, which upon finishing or after 60 minutes had passed, they were then presented with Oreo cookies, the PF. In the next stage of the experiment, BEP and BER rats were randomly assigned to either the lactose (experimental) or glucose (control) condition. At the beginning of the test, each animal was presented with a dish containing the sugar and Ensure solution in an empty cage. After finishing the Ensure solution, or after 60 minutes with the Ensure had passed, rats were placed in a regular test cage with standard rat food (Chow) and Oreos (the PF). Chow and PF measurements were taken after 2 hours and 4 hours to determine how much each rat ate. There were 3 test days. Preliminary results indicate that BEP lactose rats consumed significantly more Oreo vs. chow/body weight than the BER lactose rats (p=.02). Specifically, on the third test, BER rats that received lactose consumed PF equivalent to 1.88% of their body weight, while BEP rats that received lactose consumed PF equivalent to 2.82% of their body weight during the four hour test period.

The final test in this experiment was performed a week after the third lactose v. glucose test and intended to look for conditioned memory effects in the BEP and BER rats. Researchers hoped to determine if the rats retained a memory of the negative digestive consequence they had associated with the PF and whether that would affect their choice to consume more PF. This test included only the control glucose condition. Preliminary results point to a memory effect in the BER rats. BER rats that had previously received lactose consumed only PF equivalent to 1.05% of their body weight at 2 hours, while BEP rats that had previously received lactose consumed PF equivalent to 2.15% of their body weight after 2 hours. This indicates that the BER rats retained the impression that they would receive lower abdominal discomfort from the PF and ate less compared to the BEP group. BEP rats show less memory for the food-induced discomfort, which may possibly be related to their BE trait.

Before the animals were sacrificed at the conclusion of the experiment, they were exposed to the smell of Oreos and given a glucose + Ensure mixture to promote anticipation of the PF. Brain and blood samples were then collected from these rats and will be analyzed for neurochemical correlates related to anticipatory behaviors and biological correlates related to anxiety and emotional behaviors that may have influenced the eating patterns they displayed.

Individual differences in lactase activity among the rats may be an intervening variable in this study, and future studies may want to assess the lactase activity of each individual rat before lactose consumption.

Additionally, BEP and BER rats may differ in their level of pain sensitivity, and researchers may choose to examine the number of pain receptors in the PAG to investigate this difference.

Increase in hippocampal glutamate transporters by riluzole and other glutamate modulators as potential therapeutic target for Alzheimer's Disease

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Alzheimer's disease (AD) is characterized by progressive cognitive decline resulting from synaptic loss and neuronal death. This is hypothesized to be linked to alteration in glutamatergic circuitry and to the decreased expression of glutamate transporters. Excitatory amino acid transporter 2 (EAAT2) is the primary glutamate transporter in the brain, and accounts for approximately 90% of its glutamate clearance. EAAT2 regulates glutamate levels synaptically and extrasynaptically, making it critical for proper physiological neurotransmission. Riluzole, a known glutamate modulator used for the treatment of amyotrophic lateral sclerosis (ALS), has recently been investigated as a possible therapeutic intervention for cognitive decline. We have shown that riluzole prevents age-related cognitive decline in rats and that riluzole treatment can reverse many of the gene expression changes that occur in both aging and AD. One of these effects includes an increase in EAAT2 expression in the hippocampus. This indicates that a possible mechanism for improving cognitive function in AD patients may be to increase the expression or to enhance the function of EAAT2 in the hippocampus. The purpose of this study was to develop an assay to investigate the effect of riluzole and other known glutamate modulators on EAAT2 expression at the protein level. A subcellular fractionation was performed by sucrose gradient centrifugation on mouse hippocampal homogenates to isolate the plasma membrane, in which EAAT2 is localized. Western blots were performed and analyzed to identify the concentration of EAAT2 in mice treated with various glutamate modulators and in untreated mice. The results from this study will identify novel small molecules that target EAAT2 as a potential therapeutic agent for AD.

Role of an Intron in the Clock Gene, Period (*per*), on the Balance between Sleeping and Foraging for Food during the Day

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Introduction: Many animals exhibit a midday sleep, or siesta, a behavior aimed at minimizing exposure to heat. It has been found that the midday sleep in *Drosophila melanogaster* is controlled by an intron, termed dmpi8, in the circadian clock gene, *period (per)*. When this intron has low splicing efficiency, as in the dmpi8-wild type, the flies have a bigger midday siesta, while in a lab engineered version of this intron, dmpi8-UP, there is very efficient splicing, and the flies have less of a midday siesta (see Figure 1). However, sleep and foraging for food are antagonistic behaviors, yet both are essential for survival. Flies normally eat during the day so having a midday sleep limits when they can engage in feeding. Therefore, there is a balance (or 'trade-off') between the flies' midday sleep drive and their drive to forage.

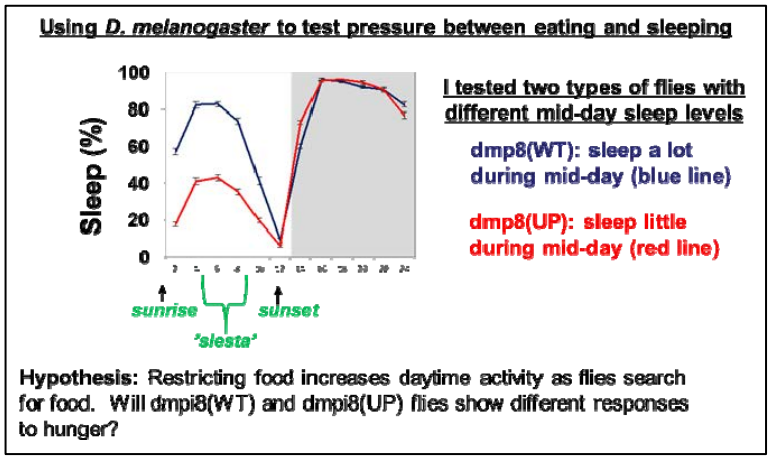

Figure 1. Background and Logic of Project

Hypothesis: In the present study, we investigated the effect of calorie restriction (leading to hunger) on midday sleep in dmpi8-wild type versus dmpi8(UP) flies. Our hypothesis was, will the lower midday sleep drive lead to a larger foraging response in dmpi8(UP) flies?

Results and Discussion: To investigate if dmpi8 splicing has a role in calibrating the balance between sleeping and eating, we measured the daily

wake-sleep patterns of wildtype and dmpi8(UP) male flies maintained on normal sugar diet (5% sucrose) and a low sugar diet (0.5% sucrose). We found that the dmpi8-UP flies showed a very large decrease in mid-day sleep levels even during the first day on a low calorie diet, whereas in the control dmpi8(WT) flies there was a relatively smaller decrease in sleep on the low sugar diet that progressively increased on subsequent days but never reached the magnitude observed with dmpi8(UP) flies (Figure 2, see next page). These results suggest that dmpi8 splicing normally acts as a 'brake' that ensures flies only minimize their safety response of a mid-day siesta after several days of hunger when survival due to lack of nutrition is now a bigger relative threat compared to avoiding the heat of the mid-day sun.

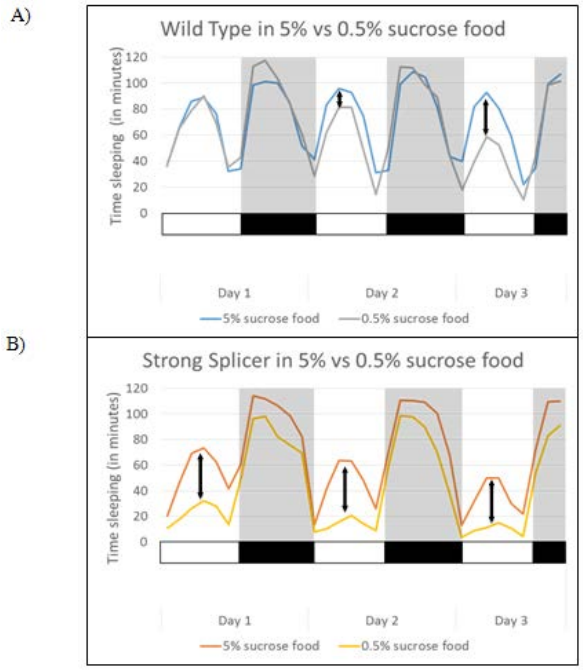

Figure 2. Effect of Calorie Restriction on Daily Sleep Pattern in Wildtype and dmpi8 (UP) flies. Flies with strong dmpi8 splicing have an enhanced foraging response (i.e., reduced midday sleep levels) to calorie restriction. Dmpi8(WT) (panel A) and dmpi8(UP) (panel B) male flies were entrained by exposure to 12 hours of light (white horizontal bar) and 12 hours of dark (black horizontal bar) for 3 days with their locomotor (or walking) activity continuously recorded. Flies were kept either under a normal food diet (5% sucrose) or a low sucrose diet (0.5% sucrose). Shown is three days of sleep levels for dmpi8(WT) (A) and dmpi8(UP) (B). The vertical arrows show the difference in the midday sleep between the flies under normal food conditions and those on low calorie diets. Note that dmpi8(UP) flies hardly sleep during the day on 0.5% sucrose even on the first day, whereas the effect of low sugar on midday sleep in wildtype flies is of less magnitude and progressively increases on subsequent days.

Virtual Simulations of Geometrical Room Acoustics

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One way to study the trajectory of a sound signal is to solve the acoustic wave equation that describes the given signal. Because a sound signal in space can have complicated shapes and properties, however, calculating a solution to the 3D acoustic wave equation has limited practical applicability in scenarios that involve irregular 3D domain boundary surfaces and mesh interiors, which are best described by non-Cartesian geometry. Using the wave equation to describe a sound signal in such a case would require the system to be broken into a large number of smaller elements, often a number too big to store in a computer's memory system. For example, a signal containing frequencies ranging from 100 Hz to 22000 Hz transmitted in a 5x5x2 m^3 room would require the storage of about 1.85×10^9 mesh elements, which translates to over 20 GB of memory. This storage is required for the points that describe the system alone, and does not include any calculations that will be done using those points.

Because describing a sound signal as a wave is complex, signal processing engineers often use a different method - ray acoustics. They consider a sound signal a ray along which its acoustic energy is transported. The propagation of a sound ray follows the same laws of reflection and refraction as light rays. This method of classification of a signal makes it simpler to determine its trajectory.

Bar Ilan University's speech and signal processing lab studies sound signals using the ray acoustics method explained above in order to develop more advanced methods of limiting sound reverberations and improving beamforming, filtering signal transmission and/or reception, in audio systems. The propagation of signals is mapped out virtually using COMSOL Multiphysics, a multiphysics software that provides an interactive setup for modeling real-world acoustic scenarios.

COMSOL's ray acoustics interface has the capability to compute the trajectories, phase, and intensity of acoustic rays. This computation feature makes acoustic calculations more manageable and practical because it uses much less computer memory than solutions to the acoustic wave equation uses. The software simulates the transmission of a sound signal from source to sink, calculates the transfer function that relates the output signal(s) to the input signal(s), and then generates a mesh of the approximate solution. Although the solution is not exact, an approximate solution is sufficient at very high frequencies or very small wavelengths.

COMSOL Multiphysics software has the ability to simulate room acoustics as explained above when transmitted sound signals contain a single frequency. Accessing a COMSOL model through MATLAB and manipulating its variables from the MATLAB interface can extend the COMSOL ray acoustics interface's capabilities to plotting signals that contain multiple frequencies. Once expanded upon, the same technique can be used to simulate any acoustic room scenario and applied to the development of reverberation and beam forming technologies.

The Role of Transcription Factors in Working Memory

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Background and Introduction: The dysregulation of transcription factors and their effects on neuronal gene expression play a key role is various cognitive disorders. Many cognitive disorders such as schizophrenia, depression, and Alzheimer's are often present in neural genes with transcriptional dysfunction. Very little is known about the potential uses of transcription factors in various forms of therapies. The hypothesis is that cognitive performance can be greatly improved by neural transcription factors.

Materials and Methods: 7 transcription factors were isolated and identified as the top deregulated transcription factors. These include, LARP1B, CBFB, CIC, E2F1, E4F1, CUL2, and CUL4B. These mRNA sequences were taken from postmortem brains, in particular the prefrontal cortex. In order to test the effects of these transcription factors mice were taken (at postnatal day 21) and the transcription factors were up -regulated via HSV vector constructs for 8 days. A series of tests were then performed to test for anxiety, depression, working memory, and sociability. The tests included: open field, light-dark box, object recognition, tail suspension, and radial armed box. The tests were all performed in one day after seven days of continuous HSV infection.

Results: Anxiety phenotypes can be measured by noting a statistical significance of $p<0.05$ The light dark box test confirmed that mice injected with LARP1b, Cul4b, E2F1 show phenotypes for anxiety. While the open field test showed phenotypes for anxiety in mice injected with E4F1, Cic mice, and CuL2.

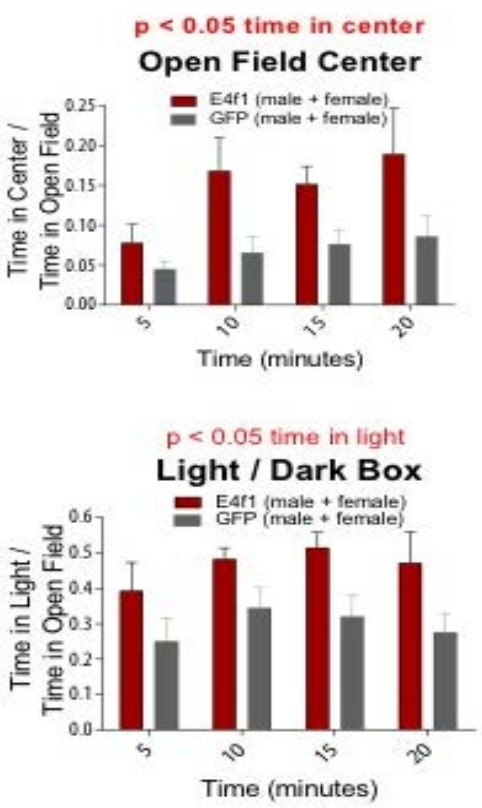

Figure 1: The time spent in center proved statistically significant as well as the time spent in the light proving phenotypes for anxiety in mice injected with E4f1.

Establishing a New Technique for the Generation of Human Peripheral Sensory Neurons for the Study of the Varicella Zoster Virus

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VZV (Varicella Zoster Virus or human herpesvirus 3, HHV-3) is a pathogenic human alphaherpesvirus that causes varicella (chicken pox). Primary infection begins with inhalation and subsequent systemic delivery to the dermis of the skin where it causes itchy, inflamed blisters. Infection also takes place in the peripheral nervous system and establishes a long period of latency in the trigeminal, autonomic and dorsal root ganglia of the peripheral nervous system. After a variable period of time, usually decades, the virus can reactivate, either spontaneously or due to a variety of factors, including increased age and immunosuppression. The reactivated virus causes herpes zoster (shingles), a disease characterized by extremely painful vesicular skin eruptions and frequently complicated by acute pain, diverse neurological sequelae, vision problems, and long lasting post-herpetic neuralgia. The events surrounding VZV's latent state and reactivation are difficult to study due to a lack of model systems for latency and reactivation because of the human specificity of the virus. There is no widely-used in vivo small animal model in which reactivation can be experimentally induced.

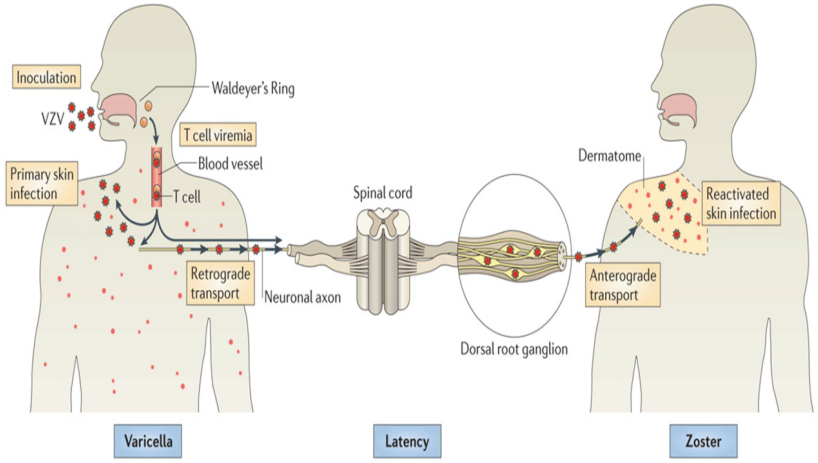

Figure 1: Schematic of VZV infection and latency

As such, there is a need to create an experimental model for VZV latency and reactivation. Since the virus is human-specific, it is necessary to obtain human neurons. Professor Ron Goldstein's lab has been creating nerve cells

for many years using embryonic stem cells. Recently, his lab established a model for latency and reactivation for VZV using these hESC-derived neurons. However, one issue with the model is that it uses a mixture of CNS and PNS neurons. Even cadaveric sensory neurons are not ideal for use as they have limited availability and have difficulty surviving in culture. The goal of the project that I worked on was to produce peripheral sensory neurons utilizing the transcription factors Ngn1, Ngn2, and Brn3a, based on a recent publication.

E-coli bacteria were transformed through heat shock, causing an uptake of lentiviral plasmids containing the specific neuronal transcription factors, which were obtained courtesy of Dr. Kristin K. Baldwin of The Scripps Institute at University of California San Diego.[1] The bacteria were plated on agar and incubated overnight to increase the plasmid amount before harvesting. The plasmid was extracted and its concentration was measured using a nanodrop spectrophotometer. After extraction, plasmids were cut with restriction enzymes and run in a gel to verify that the correct plasmids were amplified. The plasmids were then utilized to create lentivirus, a retrovirus that is derived from HIV and used as a vector to introduce foreign genes into cells. The neurogenic plasmids were transfected along with plasmids containing lentiviral packaging proteins into murine 293 cells. A control virus constitutively expressing GFP was also generated to follow visually production of lentivirus. After allowing for production of the virus for 48-72 hours, the supernatant was collected and the lentivirus was concentrated. The GFP lentivirus was tested for its ability to infect human dermal fibroblasts and 293 cells. Initial results indicate that lentivirus was generated, but at a very low yield. The neurogenic lentivirus will ultimately be used to infect embryonic stem cells in the hope that this will cause peripheral neuronal differentiation, allowing study of VZV in cells that are infected in actual varicella disease.

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Aquatic Microbial Ecology and Oceanography

Sarah Gold [1], Dr. Hila Elifantz [23], Tslil Bar [24], Etai Landau [25], Professor Ilana Berman-Frank [26]

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Nitrogen fixation is a process in which bacteria fix dinitrogen (N2) to produce a more usable form of nitrogen, such as ammonia (NH3). This biological process is an important source of creating usable nitrogen (N) for oceanic and terrestrial systems that are responsible for stimulating production and growth of microbial communities, as well as the entire ecosystem at large. [1] A significant amount of nitrogen fixation is attributed to the filamentous cyanobacteria Trichodesmium. [2] Our objective was to see if nifH, a protein specializing in nitrogen fixation in various cyanobacteria, is instrumental in Trichodesmium's diazotrophy. The techniques we used included DNA extraction and PCR. Then the amplified products were separated on agarose gel and photographed. Our results were inconclusive and further cloning and purification of the DNA samples are necessary. The East Mediterranean Sea is a nutrient-poor area which is exposed to environmental and anthropogenic impacts; therefore, it is important to monitor this ecosystem. Phytoplankton have an important role in the marine food web and are responsible for the oxygen supply of the ocean and of the Earth's atmosphere. The lab had previously been working on determining seasonal depths distribution of phytoplankton and bacterioplankton community at certain locations using the CytoSub, a machine specializing in flow cytometry, and bench top FACs (Fluorescent Activated Cytometer). In addition, we also wanted to characterize the phytoplankton and bacterioplankton community using chlorophyll and phylogenetic affiliation.

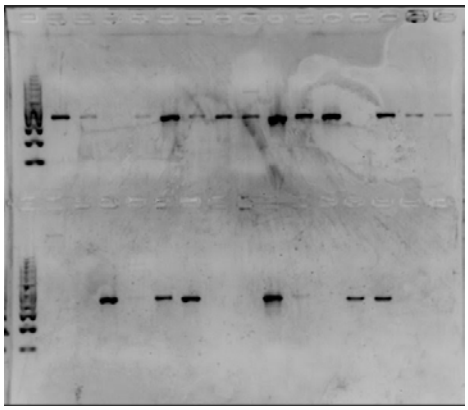

Figure 1. Photograph of the gel electrophoresis of Trichodesmium gene sequence.

We collected sea-water samples from various depths and enriched them with a stable nitrogen isotope. Future plans of researchers include estimating new and export production of organic material, specifically of N2, in the Gulf of Aqaba. Further research will be done to identify the nitrogen fixing bacteria present and quantify them using the CytoSub and the FIRe fluorometer, which is used to measure chlorophyll fluorescence in photosynthetic organisms.

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Identifying Novel Mechanistic Targets for Therapy of Niemann-Pick Type C Disease

By: [1]Rachel Gozland, [2]Ben Harpe, and [2]Kostantin Dobrenis

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Dominick P. Purpura Dept. of Neuroscience, Albert Einstein College of Medicine, Bronx NY
Summer Undergraduate Research Program

Niemann-Pick type C (NPC) disease is an autosomal recessive lysosomal storage disorder arising from mutations in either the *NPC1* or *NPC2* gene. The disease is characterized by the lysosomal storage of cholesterol and accumulation of other lipids within cells, which results in neurodegeneration and ultimately early death.

There is no known cure for NPC disease, but some treatments, such as Cyclodextrin (CD) and Miglustat (Mig), have been found to alleviate several symptoms and extend lifespan. However, the mechanisms of these drugs and exactly how they act on NPC disease are not well understood. Comprehension of these pathways of action is crucial, not only because these drugs are seeing clinical trials but also in order to improve upon these therapies and potentially identify alternative superior small molecule therapies.

One focus is to discover pathways and their constituents affected by CD, Mig, or their combined use (Combo), which has recently been tested, and to use this information to learn more about their roles in NPC disease pathogenesis and therapy. Based on our lab's previous genome wide microarray analysis of neocortex-derived material from treated and untreated mice, we conducted immunofluorescence assays to evaluate the expression of three proteins with altered gene expression not previously implicated in NPC disease: Plexin B3 and TTYH2 in untreated WT and NPC disease 8-week old mouse cerebrum; and Sez6l2 in mouse cerebellum. We employed confocal microscopy to evaluate protein localization and expression. More cells were found positive for Plexin B3 in WT than in the mutant. These corresponded to a subset of largely non-neuronal cells, resembling oligodendrocytes or microglia, in both grey and white matter, where some positive staining also appeared to encircle axons. TTYH2 also more abundantly labeled the mutant tissue than the WT, which largely, but not exclusively, co-labeled with anti-NeuN positively identified neurons (Figure 1). TTYH2 stained glia and blood vessels as well. WT cells generally showed more distinctly plasmalemmal staining while NPC disease showed higher degree of intracellular staining. Anti-Sez6l2 displayed especially strong labeling of Purkinje neurons of cerebellar cortex in WT and remaining Purkinje cells in disease mice. Purkinje cells are prominently progressively lost in this disease. Using Affymetrix software, we also performed a cursory analysis on individual transcript differences in cerebellar Purkinje cells from NPC disease mice untreated and Miglustat-

treated. For all FC>|3|, we found 27 significant changes between NPC Mig Lobules IV,V vs. NPC Vehicle Lobules IV,V; 74 between NPC Mig Lobules IV,V vs. NPC Vehicle Lobule X, and 38 between NPC Vehicle Lobules IV,V vs. NPC Vehicle Lobule X.

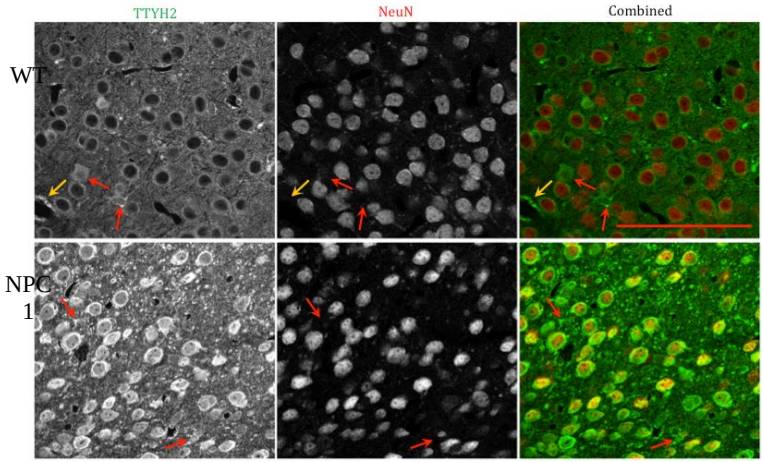

Figure 1. Distribution of TTYH2 (Tweety Family Member 2) in WT and NPC disease mouse cortical tissue. First column TTYH2 labeling, second column NeuN (neuron-nuclei) labeling, third column combination of both. Red arrow indicates TTYH2 positive non-neuronal cell. Orange arrow indicates TTYH2 positive blood vessel lining. Mean TTYH2 label intensity (N=5): WT=3.34 ± 1.44 (SD); NPC=115 ± 42.9 SD. Unpaired Student t test with Welch's correction, two-tailed, shows significant difference $p<0.05$. Scale bar = 100 μm.

To gain further insights, we applied Ingenuity Pathway Analysis (IPA) on the collected microarray data of neocortical tissue. We conducted multiple comparison analyses of predicted upstream regulator effects between NPC untreated and NPC treated with CD, Mig, or Combo. Of 63 pathways linked to upstream regulators predicted significantly altered in the disease, we identified 35 predicted to return to WT status by CD, and only 25 predicted to return to WT activity levels by Combo. In contrast, Mig treatment induced no significant changes to the disease in even the original dataset. In addition, we identified 3 upstream regulators hypothesized to be affected by CD that were not originally altered in the disease. We found one other such "side effect" involved in the Combo therapy. These findings seem to imply that CD may by far be the most effective treatment of the three, and that the addition of Mig might only hinder the effectiveness of CD. Future investigation of specific upstream regulators identified may clarify if and how they are in fact affected by NPC and its treatments.

We are grateful to Andrew Smith, Kevin Fisher, and Ben Papapietro for their unrelenting support and guidance. We would also like to thank the Summer Undergraduate Research Program for this valuable experience. This study was supported by NIH grant NS053677 and a 2016 Einstein IDDRC Pilot Award.

Effect of Heat Shock on *Plasmodium falciparum* Response

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Malaria is a life threatening parasitic illness caused by the *Plasmodium* genus. The deadliest species is *Plasmodium falciparum*. The parasite has a complex life, cycling between mosquito vector and human host. The human blood stage, where the disease manifests, has 3 stages of development over 48 hours – rings, trophozoites, and schizonts. [1] [2]

Heat shock proteins are a class of chaperone proteins produced by cells under stress. When infected patients begin to show symptoms, *P. falciparum* experiences heat shock in cycles of six hours, reaching temperatures of 41°C. Accordingly, about 2% of the parasite's genome encodes for these proteins.[3]

Extra-cellular vesicles released by cells are known to be used to transfer information between cells, including proteins, RNA, and DNA. One type of these vesicles is exosomes, vesicles of about 30-150nm in size, that are generated by an endosome budding into itself. This creates a multi-vesicular body within the cell, which is then secreted.[4] It has recently been shown that *P. falciparum* uses exosomes to communicate as well, even though it is an intracellular organism.[5]
Our overarching goal is to determine how *P. falciparum* react to stressful conditions such as heat shock. This project compared the expression of heat shock proteins by the parasite with and without heat shock. We also analyzed the exosomes to see if they are used to transfer these proteins between cells.

Preliminary results showed that calibration was needed with the heat shock protein detection assays. We are optimizing amounts of protein needed and concentration of antibodies used for protein immunoblot assays using Western blot analysis under heat conditions. We are also isolating exosomes and analyzing their protein cargo in particular to detect heat shock proteins within the exosomes. Early results indicate that there may be an increase in the amount of heat shock proteins after a six-hour heat shock, in both the cells themselves and in the exosomes.

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Effect of β-catenin Inhibitors on Growth of Vascular Smooth Muscle Cells and Endothelial Cells and its Applications

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Introduction: Vascular remodeling occurs in response to injury and disease, as seen in atherosclerosis and restenosis. Vascular injury damages endothelial cells (ECs), triggering inflammation and thrombosis, and releasing factors that activate smooth muscle cells (SMCs). SMCs in turn migrate, proliferate, and remodel the extracellular matrix, aiming at healing the vessel wall. Recovery of the endothelium is also critical for healing. Excessive proliferation of SMCs, however, or delayed recovery of ECs, promotes formation of a neointima that blocks the arterial lumen, limiting blood flow and causing tissue ischemia. The mechanisms controlling SMC and EC activities after vascular injury are not fully elucidated. Genetic studies suggest that β-catenin is required in ECs only in the central nervous system circulation, while in SMCs, it is essential for artery formation and neointima formation after vascular injury (Figure). Based on these observations, *we hypothesize that pharmacologic inhibition of β-catenin inhibits growth of SMCs while not affecting EC growth*.

Methods: We evaluated growth of mouse aortic SMCs, human coronary artery SMCs, and mouse cardiac ECs in culture using AlamarBlue after exposure to increasing concentrations of β-catenin inhibitors: PKF118-310, ICG001, XAV939, and Carnosic Acid. We also evaluated the effect of these inhibitors on β-catenin activity in SMCs using a TOPflash reporter system.

Results: We found that PKF118-310, ICG001, and XAV939, but not Carnosic Acid, inhibit mouse and human SMC growth in a dose-response manner. PKF118-310 and ICG001 also inhibited mouse EC growth in a dose-response manner, but with decreased potency; while XAV939 did not affect EC growth. We also found that PKF118-310, ICG001, and XAV939, but not Carnosic acid, inhibit β-catenin/TCF activity in SMCs.

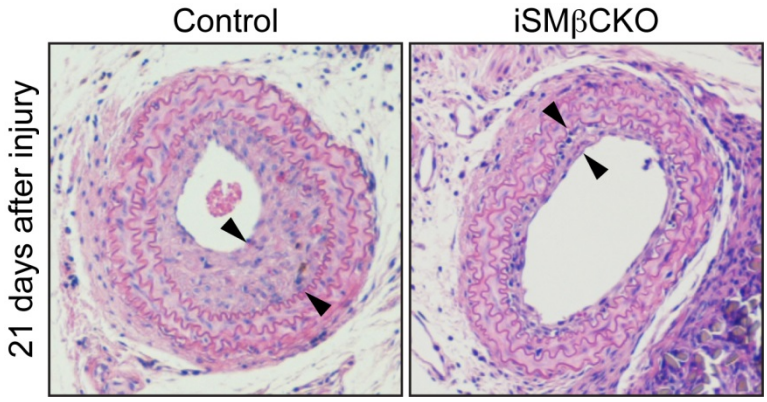

Fig. 1. H&E-stained carotid arteries after vascular injury in control and inducible SMC β-catenin KO mice (iSMβCKO). Arrowheads indicate the neointima.

Conclusion: These studies suggest that blocking either β-catenin/TCF interaction, CBP/β-catenin C-terminal interaction, or promoting the activity of the destruction complex are effective strategies to inhibit growth of SMCs, with a less pronounced effect on ECs; however, the ECs used were not primary cells and this might explain their decreased sensitivity. We are currently testing primary human coronary artery ECs. *Lastly, pharmacological inhibition of β-catenin inhibits growth of vascular SMCs in culture, providing a rationale to study these inhibitors in models of vascular injury as they hold promise as novel therapies for cardiovascular disease.*

Neurological Diseases from a Structural Biology Standpoint

By: Temima Kanarfogel[1], Ayala Ouanounou[1], Elisheva Stern[1], Zachary Farino[2], Stephanie Siegmund[3] and Zachary Freyberg[2]

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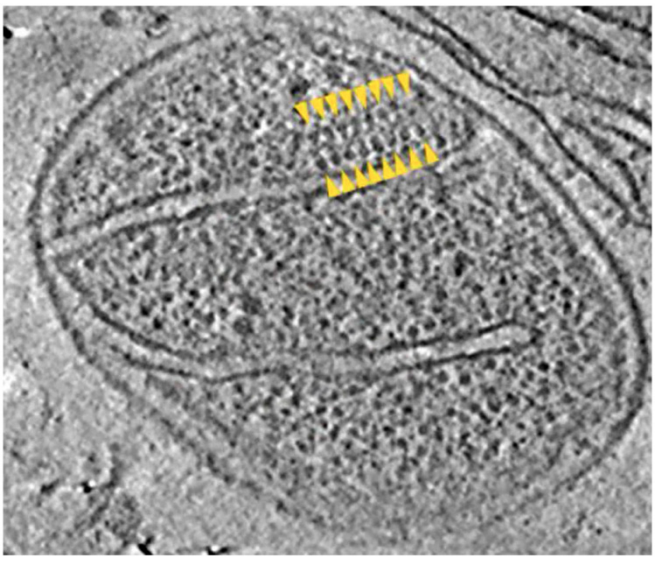
The mitochondria are the powerhouse of the cell. ATP, which is our bodies' source of energy, is produced by ATP synthase molecules found lining the cristae of the mitochondria. ATP synthase is composed of two subunits: the F_1 and F_0 subunits. Furthermore, the ATP synthase only functions aerobically when dimerized. Through aerobic respiration, 36 ATP molecules are produced, whereas in anaerobic respiration, only 4 ATP molecules are produced. Therefore, when the body lacks oxygen, a substantially smaller amount of ATP molecules is produced. This is particularly relevant clinically since there is increasing evidence that a subset of patients with neurological disorders caused primarily by mutations in the ATP synthase molecule. Consequently, we sought to better understand the relationships between disease-causing changes in ATP synthase structure and their effects on the mitochondria as a whole. The challenge of this research was to discover whether this dysfunction is responsible for the symptoms diagnosed in unhealthy patients. Cells were thus collected from patients with neurological diseases as well as healthy patients. We then applied an emerging technology, cryo-electron tomography to visualize these cells in a near-native state. This research introduced a new way to look at the structural biology of people with neurological diseases, their symptoms and blood works.

In order to generate a three dimensional structure of the ATP synthases in mitochondria derived from both healthy controls and patients with a disease-causing mutation in the ATP synthase dimerization domain, we first established a plan for picking the ATP synthases on previously imaged, low-pass filtered tomograms. First, the electron dense groups projecting from the mitochondrial cristae membrane were picked and classified according to the certainty of their identity. We began by picking the particles we were most certain to be ATP synthases, followed by those of intermediate certainty and finally those of least certainty. During picking, we then processed the monomers first, centering the marking box on the head group of the electron dense particles, regardless of whether or not there was an obvious binding partner. Then, the same plan was followed for the putative dimers, picking them from the center between the two head groups. The resulting coordinates were averaged to generate a three dimensional structure.



“Movie 1. Tomographic volume of a small, intact P. anserina mitochondrion shown in Fig. 1. Rows of ATP synthase F1 heads along cristae membranes are marked by yellow arrowheads or by small yellow spheres in the segmented, surface-rendered volume. All densities identified as ATP synthase heads are arranged in rows of dimers along the sharply curved cristae edges. Outer membrane, gray; cristae membranes, blue; inner boundary membrane, blue-transparent; ATP synthase, yellow.”

N.B. Image and legend from Davies et al. 10.1073/pnas.1103621108 “Supporting Information”

Pending research is anticipated to confirm the predominantly dimerized ATP synthase in cells of control patients, and ATP synthases in affected patients. Ultimately, we hope that future research can use data from these studies to develop an improved understanding of the molecular mechanisms by which changes in ATPase synthase structure impact mitochondrial structure and function, particularly in the context of neurological and psychiatric illness.

Acknowledgements:
We thank the New York State Psychiatric Institute, Columbia University and our team of experts in allowing us to share this research experience.

Studying Hui1 and KcsA through NMR Spectroscopy

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K+ channels in cell membranes allow K+ ions to translocate through the cell membrane. Several toxins (such as the ShK toxin from the sea anemone) were found to inhibit K+ channels and are being used for therapeutic and scientific applications. Therefore, inhibiting specific K+ channels is of great importance. One specific toxin, ShK, was found to inhibit the hominine voltage gated K+ channel (Kv1.3). ShK, however, does not bind to the model K+ channel KcsA. Scientists in Brandeis University used the amino acid sequence of ShK to manufacture a toxin that can inhibit KcsA. The result is a new toxin called Hui1.

What this study intends to investigate is what makes Hui1 bind to KcsA while ShK cannot. In order to understand this we must study the binding of Hui1 to KcsA. The first step is to express the toxin in E. coli. However, due to the disulfide-disulfide interactions in Hui1, there is a high probability that Hui1will fold incorrectly while being expressed in bacteria.
In order to correct this problem, the toxin must first be unfolded then refolded in the correct structure. Hui1 is expressed with a his-tag and a TEV cleavage sequence. First, Urea and DTT are used for unfolding Hui1. The his-tag is used for binding Hui1 to a nickel beads column. Washing the column with Urea and DTT unfolds the protein. Gradually removing Urea and DTT enables Hui1 to refold in the correct structure (with the right disulfide bridges). Elution of Hui1 from the column is obtained by washing the column with a high concentration of imidazole buffer. Next, TEV, a protease enzyme, is added to Hui1 solution thus detaching the his-tag from the correctly folded toxin. Lastly, the toxin solution is leofilized and the toxin is dissolved in another buffer solution for NMR measurements.

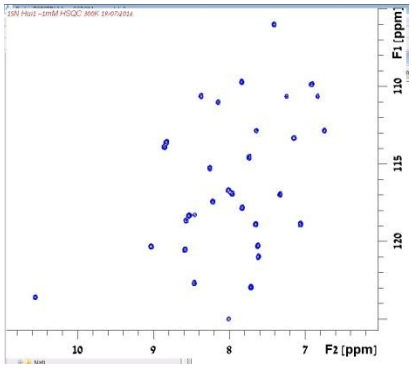

Figure 1. NMR spectrum of Hui1

In the NMR, each peak represents an amino acid in the protein sequence (except proline).The NMR peaks of Hui1 as shown in figure 1, allow us to study the structure and dynamics of the toxin. Future studies will allow understanding the nature of the binding between Hui1 and KcsA. This will give us a clue about how other toxins bind to different K+ channels.

ERRα regulates the growth of triple-negative breast cancer cells via an S6K1-dependent mechanism

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Triple-negative breast cancer (TNBC) constitutes 10-17% of all breast cancer cases and correlates with more aggressive tumors and poorer prognoses. Because TNBC cells lack hormone receptors for estrogen, progesterone and HER2, they cannot be targeted by traditional endocrine therapy, and necessitate the development of alternative treatments. Estrogen-related receptor alpha (ERRα) is an orphan nuclear factor that is a critical regulator of cellular energy metabolism, and is highly expressed in ERα-negative breast cancer. ERRα regulates transcription of several enzymes active in glycolysis, tricarboxylic acid cycle (TCA), and macromolecular metabolism, therefore enabling cancer cells to adapt and survive in growth-restrictive conditions.

The mammalian target of rapamycin complex 1 (mTORC1) is a key integrator of cell signals involved in the regulation of many anabolic processes, including cellular metabolism, growth and proliferation. mTORC1 is sensitive to inhibition by rapamycin, a naturally derived agent and an FDA-approved drug. The 40S ribosomal S6 kinase 1 (S6K1) is a prominent kinase downstream of mTORC1 which regulates cell size and cell cycle progression by phosphorylating several proteins controlling these processes. In certain cases, S6K1 expression can become significantly increased, leading to more aggressive tumors. However, S6K1 overexpression also sensitizes the tumor cells to S6K1 inhibitors.

In light of the known crosstalk between ERRα and the mTORC1/S6K1 signaling pathway, we explored whether ERRα affects the expression of S6K1 in ERα-negative breast cancer cells. Indeed, we found that ERRα negatively regulates S6K1 expression. Moreover, we found that ERRα achieves this regulatory effect by directly binding to the S6K1 promoter. By treating ERα-negative MDA-MB-231 cells with mTOR inhibitor rapamycin or S6K1 inhibitor PF4708671, we also demonstrated that ERRα inhibition sensitizes cells to mTOR/S6K1 inhibition and consequently reduces cancer cell growth and metastasis.

Clinical applications of the novel mechanism that we uncovered have the potential to improve the treatment of ERα-negative breast cancer cases. Patients may benefit from treatment that combines ERRα inhibitors with mTORC1 inhibitors, such as rapamycin, or with S6K1 inhibitors, which are under clinical development.

The Role of Transcription Factors in Working Memory

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Within the context of neuronal gene expression, malfunctions in transcription regulation can often provoke the development of common cognitive disorders such as schizophrenia, Alzheimer's disease, and depression as these transcriptional dysregulations often contribute to Our experiment sought to examine several of the transcription factors that are responsible for these malfunctions and to discover how each one is responsible for the various symptoms of schizophrenia.

The first step of this experiment was to identify the most common dysregulated transcription factors. They were identified using the Common Minds Consortium (CMC) postmortem mRNA-seq data from the prefrontal cortex. The transcription factors found were LARP1B, CBFB, CIC, E2F1, E4F1, CUL2, and CUL4B.

The second and most vital portion of the experiment involved injecting mice that were postnatal day 35 in the prefrontal cortex with a different one of these transcription factors every week, so as to overexpress the transcription factor and to thus examine the phenotypes associated with it. The first group of mice used were injected with GFP, or green fluorescent protein, which was used as a control group. A variety of behavior tests were used, including open field, light-dark box, object recognition, forced swim, radial arm maze, elevated plus maze and sociability tests to explore anxiety, working memory, depression, and sociability phenotypes, all of which are symptoms known to be associated with schizophrenia. All tests were performed between five and seven days after the initial injections.

The following is a summary of the tests performed on the mice every week:

1. Open Field: the mice were placed in an open field chamber consisting of a white Plexiglas box (40 x 40 cm, 30 cm high), illuminated with bright white light (350 lux) for twenty minutes at a time. This test was designed to test the overall anxiety and exploratory behavior of the mice. The more time the mice would spend in the center of the box, the less anxious they were. This test also measured the overall distance and stereotypical behavior of the mice.
2. Light-Dark Box: the mice were again placed in the same chamber as was used for open field, this time, however, with a black plastic box placed in the field. The box had a black plastic lid and an opening on the bottom to allow the mouse to enter the surrounding arena. The mice were placed in the open field chamber with the

black box for twenty minutes. This test was also designed to measure the overall anxiety of the mice.

3. Object Recognition test: This was a three day test with a different phase taking place every day. The first phase involved habituating the mice to the object recognition chamber (similar to the open field chamber). The second phase involved the introduction of three objects made out of playing cards that were crafted into a triangle, box and bowtie. The goal was to have the mice spend an equal amount of time with every object. On the third day, the bowtie was taken out and replaced with a polyhedron. The goal was to test the working memory of the mice and to see if they spent more time with the novel object (the polyhedron) than with the familiar objects (the triangle and box).
4. 3 Chambered Sociability test: The first phase of this test involved habituating the mice to the sociability chamber by having them spend ten minutes exploring the center chamber and ten minutes exploring all three chambers. The second phase was conducted a day later and involved habituating the mice to the center and and full chamber for five and ten minutes, respectively, this time with corrals in each of the side chambers. After this, a sex and age matched stimulus mouse was placed into one of the corrals, while an object was placed in the other, and the mouse was placed in the center and tested for interactions with the stimulus mouse for 10 minutes. A novel sex and age matched stimulus mouse was then placed in the second corral and the mouse was placed in the center and tested for interactions with the stimulus mouse for 10 minutes. The goal was to test the sociability and social novelty of the mice.
5. Forced Swim: The mice were placed in a large beaker of water for ten minutes at a time. The amount of time the mice spent struggling to stay above water (as opposed to merely falling limp) was recorded. The goal was to test for signs of depression in the mice. The more time spent struggling to stay above water, the less depressed the mouse was.
6. Elevated Plus Maze: the mice were placed at the center of an elevated plus shaped maze with two closed arms and two open arms. The time that the mice spent in the open arms, closed arms and center were recorded. The goal was to test for anxiety: the longer the mouse spent in the open arms, the less anxious it was.

Results:

The following are the results of our experiment:

- The Larp1b mice exhibited phenotypes for anxiety (light-dark box) and better working memory
- The Cul4b mice exhibited a phenotype for anxiety (light dark box).
- The E4F1 mice exhibited a phenotype for anxiety (open field and light dark box)

- The Cul2 mice exhibited phenotypes for anxiety (open field).
- The E2F1 mice exhibited phenotypes for anxiety (light dark box) as well as decreased sociability and a lesser preference for social novelty
- The Cic mice exhibited phenotypes for anxiety (open field)

Estrone and hydroxyprogesterone regulate human endothelial Nitric Oxide Synthase System through the modulation of cationic amino acid transporter-1

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Endothelial cell dysfunction (ECD) is characterized by the reduced production of nitric oxide (NO) by endothelial NO synthase (eNOS). Cationic amino acid transporter-1 (CAT-1) regulates eNOS activity by regulating arginine transport (Figure 1). CAT-1 mediates the bidirectional transport of cationic amino acids, thus supporting vital metabolic functions, such as protein synthesis, nitric oxide (NO) synthesis, polyamine biosynthesis, and inter-organ amino acid flow. Two experimental models of ECD have shown that in females, but not in males, CAT-1 activity is preserved with age and in chronic renal failure. Therefore, it is theorized that arginine transport is regulated by female sex hormones.

Human umbilical vein endothelial cells were treated with female sex hormones, either by estrone, an estrogenic hormone, or hydroxyprogesterone, an endogenous progestogen steroid. Exposure to estrone (50 and 100 nM for 1 hour) resulted in an increase in arginine uptake alongside a decrease in the inactive phosphorylated form of the protein, CAT-1. Treatment with hydroxyprogesterone (1 and 100 pM for 1 hour) reduced arginine uptake and increased phosphorylated CAT-1. Co-incubation with both hydroxyprogesterone and estrone for 1 hour resulted in reduced arginine transport.

While estrone increases arginine transport and CAT-1 activity through the post-translational modification of the inactive form of the amino acid transporter, CAT-1, hydroxyprogesterone inhibits arginine transport and CAT-1 activity via post-translational inactivation of CAT-1 by phosphorylation, an effect that predominates estrone.

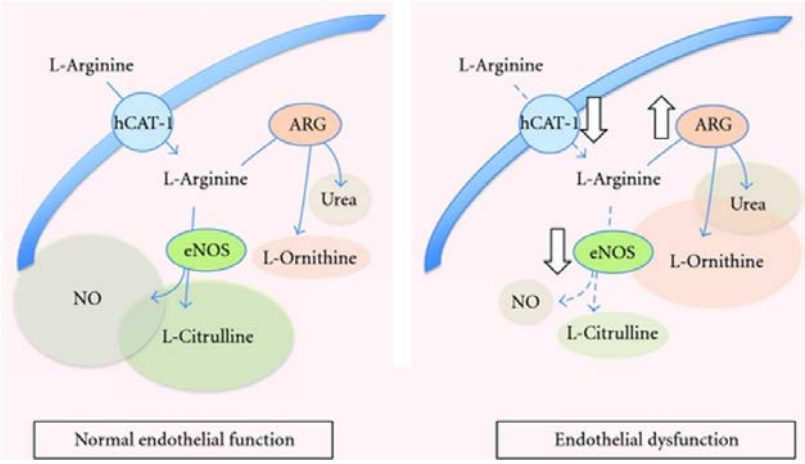

Figure 1- In human endothelial cells, L-arginine is taken up via human cationic amino acid transporter-1 (hCAT-1) which is then metabolized by either the endothelial nitric oxide synthase (eNOS) into L-citrulline and nitric oxide (NO), or via arginases (ARG) into L-ornithine and urea. These processes are manifested in normally functioning endothelial cells. In endothelial dysfunction, hCAT-1 and eNOS expression and activity are reduced resulting in decreased L-arginine uptake and NO synthesis.

Oral Ketamine for Management of Treatment Resistant Depression

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Major depression is a devastating common disorder. Current pharmacotherapy relies on monoaminergic neurotransmitters (dopamine, serotonin) modulation and requires a time lag for full therapeutic effect. Regrettably, about 40% fail to attain remission, defined as patients suffering from Treatment Resistant Depression (TRD). Recently, intravenous ketamine has been shown to provide rapid, short-lived, amelioration of TRD. Ketamine operates, in part, by increasing the release of glutamate, via inhibition of GABAergic interneurons (Figure 1). We aimed to assess the clinical efficacy and safety of oral ketamine for TRD in the community setting.

In a double-blind, randomized, placebo-controlled trial 35 TRD outpatients received 1mg/kg of oral ketamine or placebo for 21 days. Patients were evaluated pre-trial and on days 7, 14, 21 and 28. The main outcome measure was the change in Montgomery Asberg Depression Rating Scale (MADRS) score.

18 subjects were randomized to the ketamine group, and 17 to the placebo group. Of these, 14 and 11 respectably completed the study. No significant between-group differences were found at time point zero. A significant reduction of 13.4 points in the MADRS score was observed on day 21 in the ketamine group only ($p=0.003$), while a nonsignificant reduction of 2.9 points was observed in the placebo group. Five subjects (29%) in the ketamine group achieved clinical remission (MADRS ≤ 10) compared to none in the placebo group. No serious adverse effects were reported.
In this study, sub-anesthetic oral ketamine in the outpatient setting produced rapid amelioration of depressive symptoms in ambulatory TRD patients, which could be sustained by repeated dosing and was well tolerated. The results of this study suggest that oral ketamine may hold significant promise as a novel ambulatory treatment option in the care of TRD.

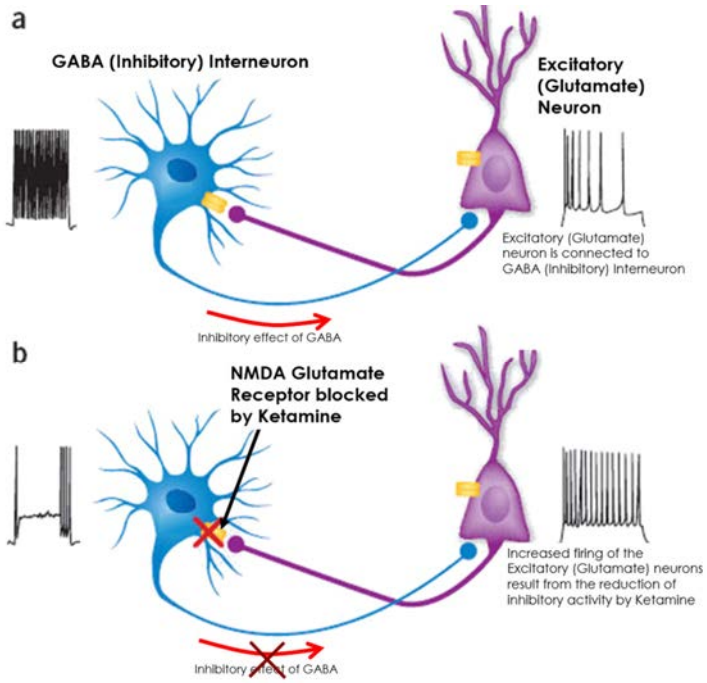

Figure 1: GABA interneurons inhibit excitatory (Glutamate) neurons. Ketamine downregulates glutamate receptors (NMDA type) on inhibitory interneurons. As a result, neural transmission of excitatory neurons is enhanced.

The Effect of Maternal Weight on Gene Expression in Offspring

By: Marjorie C. Liebling[1], Samuel E. Zimmerman[2], Lyda Williams[3], Maureen J. Charron[3,4], and Jessica C. Mar[2,5]

[1]Stern College for Women, Yeshiva University, New York, NY, [2]Department of Systems and Computational Biology,[3,4]Departments of Biochemistry, Medicine (Endocrinology) and Obstetric & Gynecology and Women's Health, [5]Department of Epidemiology and Population Health, Albert Einstein College of Medicine, New York, NY

Obesity in mothers during pregnancy is known to have negative effects on the health of their offspring. However, the molecular pathways that control these effects is not well understood. Computational biology is a field in which statistics is combined with high-throughput molecular assays that collect large data sets and the overall goal is to use statistical methods to derive robust inferences from the data generated. Because the data sets contain inherent measurement error, statistical models must be used to parse out signal from noise so that a sound breakthrough can be reached. The goal of this study was to investigate the correlation between maternal pre-pregnancy BMI and gene expression in the offspring. Such a correlation would be illuminating for understanding gene and pathway-related influences of maternal health on the health of offspring. Expression values of 57,569 T lymphocytes (CD3+) were purified from umbilical cord blood of babies whose mothers' pre-pregnancy BMI ranged from healthy to obese. The null hypothesis was that there is no significant correlation between maternal weight and gene expression in offspring.

Given the magnitude of the number of expression values for 20 patient samples, analysis was done using the statistical program, R. The data was first filtered such that remaining genes would have expression values greater than zero for 75% or more of the patient samples in a given group. The filtering step is important because it removes genes with extremely low expression which may be due to genes having noisy signal. Approximately 17.6% or 10,138 of the genes survived filtration. A two-sample t test was then conducted on the remaining genes between the healthy and overweight groups, the healthy and obese groups, and the overweight and obese groups. Following adjustment[1] for multiple testing, there were no significant P-values from all comparisons, suggesting that there is no significant differential expression between maternal pre-pregnancy BMI and gene expression in offspring.

Next, the data was run through the *attract*[2] package. *attract* is a method that identifies pathways or gene sets with group-specific expression. The pathways or gene sets are defined from databases that consolidate information from the scientific literature. Each pathway is ranked according to an adjusted P-value. The significance threshold for the adjusted P-values was set to 0.05. Significant pathways were found in the KEGG (1), GO

Biological Processes (1), and C7:Immunological Signatures (6) database from MSigDB/GSEA (Table 1). *attract* finds the synexpression groups, or groups of coordinately expressed genes, in each significant pathway.

Synexpression groups may indicate genes that have related functions or similar profiles that define a group, e.g. expression patterns specific to the overweight group (Figure 1).

Database:	Significant Pathway:
KEGG	Hepatitis C
GO: Biological Processes	Actin Filament Based Movement
C7: Immunological Signatures	Genes Down Regulated in B Lymphocytes, Genes Up Regulated in Dendritic Cells, Genes Down Regulated in Healthy PBMC V. Acute S. Pneumoniae Infected PBMC, Genes Up Regulated in DC Stimulated with CpG DNA at 4 V. 24 Hours, Genes Up Regulated in Macrophages with IL10 Knockout, Genes Up Regulated in CD T Cells

Table 1: Pathways outputted by *attract* with adjusted p.values < 0.05 from various pathway databases.

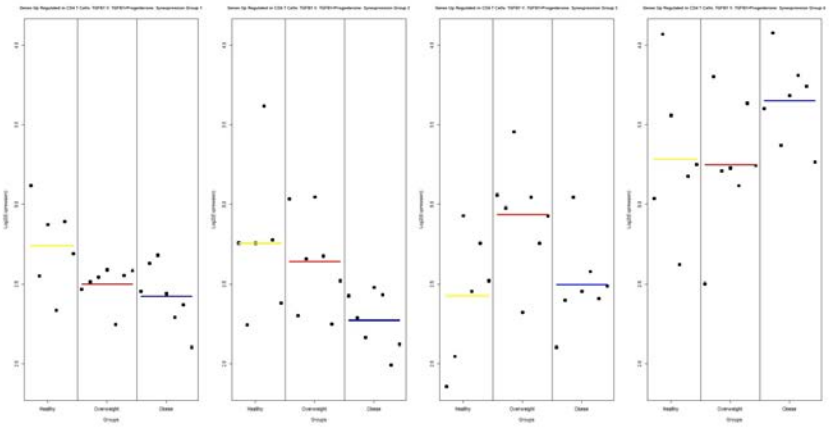

Figure 1: Average expression profile of genes in the Genes Up Regulated in CD4 T Cells: TGFB1 V. TGFB1+Progesterone pathway. There are 24, 21, 13, and 7 genes in synexpression group s 1 to 4, respectively and show BMI group-specific expression. Midline bar represents mean expression.

Our conclusion from this study is that no specific genes were differentially-expressed between the two non-healthy BMI groups versus healthy comparisons. This suggests either differential expression could be present for genes in patient sub-groups based on variables that we were unable to test due to the experimental design, e.g. clinical factors like smoking status. Alternatively, these results may suggest that the effects on offspring health may be regulated by more subtle signatures that are represented by multi-

gene effects. From the pathways identified by *attract*, the most interesting signature was one found from a study that looked at genes regulated by progesterone in T cells. This signature is potentially informative because it is the same cell type as the one used in our study. Further interpretation of these results is ongoing.

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[2]Mar JC, Matigian NA, Quackenbush J, Wells CA. *attract:* A Method for Identifying Core Pathways That Define Cellular Phenotypes. Csermely P, ed. *PLoS ONE*. 2011;6(10):e25445. doi:10.1371/journal.pone.0025445.

The Effects of Antimalarial *Plasmodium falciparum* Equilibrative Nucleoside Transporter 1 (PfENT1) Inhibitors on Human Purine Transporters

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Malaria is a serious public health threat, with roughly 200 million infections and 500,000 deaths reported annually. The majority of fatal cases occur in regions of sub-Saharan Africa, and are largely caused by *Plasmodium falciparum*. Effective antimalarial drugs, such as chloroquine and artemisinin, have been developed. However, the emergence of drug resistant parasites has reduced the efficacy of chloroquine and threatens the efficacy of artemisinin. Thus, it is necessary to develop new antimalarial drugs.

Malaria parasites are purine auxotrophs; they rely on purine acquisition from the host. The primary equilibrative nucleoside transporter, PfENT1, is utilized in all erythrocytic stages. Previous research showed that *pfent1* knockout parasites are not viable when grown in media containing physiological purine concentrations (<10 μM). This implicates PfENT1 as the primary purine transporter and suggests that it may be an excellent drug target.

One hundred seventy-one PfENT1 inhibitors were identified using a yeast-based high throughput screen; nine of the most efficacious were chosen for further characterization. We performed parasite cytotoxicity assays to determine the efficacy of these compounds. The concentration dependence of parasite killing was assessed after 48 hours of growth by measuring DNA content, using a SYBR Green assay.

We determined the specificity of the nine compounds for PfENT1 relative to the human red blood cell (RBC) purine transporters, human equilibrative nucleoside transporter 1 (hENT1) and human facilitative nucleoside transporter 1 (hFNT1) (Fig.1). Adenosine is transported by hENT1 but not by hFNT1 and conversely, hypoxanthine is transported by hFNT1 but not hENT1. We assayed the efficacy of the nine PfENT1 inhibitors against these transporters by the concentration dependence of inhibition of either [^{3}H]adenosine or [^{3}H]hypoxanthine uptake into uninfected red blood cells. The compounds collectively displayed lower IC50's against the erythrocyte purine transporters than in parasite growth inhibition (Fig.2). The findings indicate a higher affinity and thus specificity for PfENT1 over hENT1 and hFNT1.

Future research will seek to improve the potency of these compounds for PfENT1. In previous experiments, PfENT1 inhibitors killed the *pfent1* knockout parasites, albeit with lower affinity than against wild-type parasites. This suggests that the compounds hit a secondary target in addition to PfENT1. The dual targets would significantly decrease the likelihood of parasites developing resistance against the drugs. As the compound potency is improved through medicinal chemistry, we will attempt to sustain efficacy against both targets.

We thank Nirupama Nishtala for her assistance and guidance on this project.
Supported in part by NIH grant RO1-AI116665 and the Einstein SURP program.

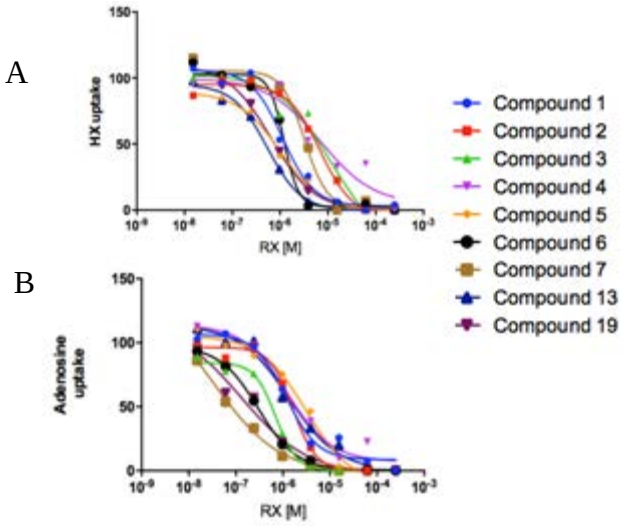

Figure 1: Normalized concentration-dependent purine uptake inhibition curves measuring the inhibition of the nine compounds on **A)** [^{3}H]hypoxanthine and **B)** ^{3}H]adenosine in uninfected RBC's.

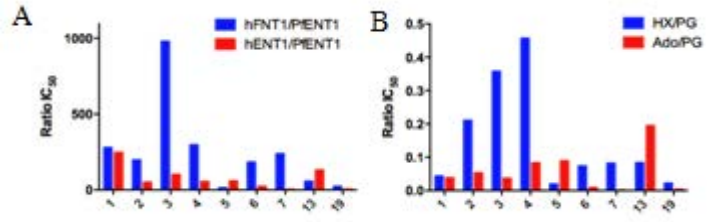

Figure 2: A) IC50's for inhibition of hypoxanthine uptake via hFNT1 and **B)** adenosine uptake via hENT1 by individual compounds, divided by IC50's of those compounds for PfENT1 adenosine uptake inhibition.

Examining Pharyngeal Apparatus Development in *Tbx1-Cre/+;Foxi3$^{f/f}$* Mouse Embryos to Explain Thymus and Parathyroid Defects

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TBX1 is a T-box transcription factor gene and its haploinsufficiency causes 22q11.2 deletion syndrome (also called DiGeorge and velo-cardio-facial syndrome). Global inactivation of *Tbx1* in mouse embryos causes perinatal lethality and embryos exhibit cardiovascular, craniofacial, thymus and parathyroid defects. These defects can be explained by abnormalities in the pharyngeal apparatus (PA) that occur early in development within Tbx1 null embryos since PA formation and segmentation is crucial for proper embryonic development. *Foxi3* is a gene downregulated in expression in *Tbx1* null mutants and is involved in PA segmentation. Foxi3 encodes a Fox-family transcription factor and Foxi3 null embryos also have PA segmentation defects. To determine if there is a genetic interaction between these two genes, we generated *Tbx1 +/-;Foxi3 +/-* embryos that have parathyroid and thymus defects at E15.5. We also generated conditional *Foxi3* null mutants using the Tbx1-Cre/+ allele and found even more severe thymus and parathyroid defects. Since the parathyroid and thymus are derived from the third pharyngeal arch, we wanted to determine if these mutants have pharyngeal apparatus defects early on in development. We performed whole mount in situ hybridization (WMISH) with RNA probes for PA markers *Dlx2* and *Fgf8* to determine if there were PA segmentation defects and results indicated that both genes are downregulated in both mutants in comparison to their controls. This finding can help in understanding the molecular mechanisms of 22q11.2 deletion syndrome and lead to further research for more targeted therapeutics.

SickKids Paediatric Orthopaedic Pathways: Parental Satisfaction Towards Clavicle, Proximal Humerus, and Supracondylar Fractures with Reduced Clinical Visits

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Clinics are a primary point of access to specialized care at SickKids Hospital. More than 16,000 patients utilize the Orthopaedic clinics each year[1]. Through an audit conducted, the fracture clinic at SickKids hospital currently holds a 52% adherence rate towards the SickKids Paediatric Orthopaedic Pathways (SKPOPs). The SKPOPs are web-based clinical pathways that assist primary-care physicians, emergency room physicians, and orthopaedic surgeons in making decisions about appropriate and effective care for their patients. The primary goals of the SKPOPs are to improve the efficiency of care delivered without impacting clinical outcomes. Previous research has proven that clinical treatment pathways are crucial tools used to streamline care, inform patients, allow for clear expectations of care, reduce mistakes and decrease healthcare costs. Although there has been an exorbitant amount of research conducted regarding the benefits and successes of clinical pathways, there has been a gap in patient satisfaction, specifically parental satisfaction in the utilization of clinical pathways in paediatrics. This research completes the knowledge gap by measuring the level of parental satisfaction with utilized clinical pathways.

Current and previous research utilizing clinical pathways was sought out, and over ninety articles were noted for relevance. Of those articles, ten articles were critically chosen to influence the questionnaire's key topics and questions. The questionnaire was comprised of eight questions, two utilizing the Likert scale and six utilizing open ended responses to maximize parents' responses. The questionnaire was asked verbally and accompanied by a research student, and was directed to parents of patients that possessed a clavicle, supracondylar, or proximal humerus fracture where the physician adhered to the SKPOPs. Based on an extensive literature review, a questionnaire was generated that explored variables believed to influence parental satisfaction. Importantly, the questionnaire accounted for confounders that may have influenced parental satisfaction including but not limited to: accessibility to a family doctor, wait times, changes to regular work and day schedule, and information provision. Parents were also given the opportunity to provide feedback and suggestions about the SKPOPs. The questionnaire was administered for eight weeks and excluded patients with fractures other than clavicle, supracondylar, and proximal humerus fractures, as well as all fractures that did not follow the SKPOP follow up care. The most frequently surveyed fractures were clavicle fractures, followed by

supracondylar fractures, while proximal humerus fractures comprised the least frequently surveyed.

To determine parental satisfaction, the survey focused on three areas: satisfaction with information provision, fulfilled expectations, and the recommendation of the fracture clinic.

When the respondents were asked if they were satisfied with the information provided by the physician, 100% of the participants answered yes, and 0% of the participants responded no. Additionally, utilizing the Likert scale, respondents were asked to what extent they agreed with the statement that the appointment had met their expectations. 4% of respondents disagreed with the statement, 37% of respondents agreed with the statement, while 59% of respondents strongly agreed with the statement. The last indicator used to calculate parental satisfaction was determined when the participants were asked if they would recommend the SickKids fracture clinic to a friend whose child needed treatment for a fracture. No respondents disagreed or strongly disagreed with the aforementioned statement. Less than five percent of participants stated that they were neutral regarding recommendation, less than one quarter of the participants surveyed stated that they agreed that they would recommend the fracture clinic, and more than three quarters of the participants surveyed stated that they strongly agreed with recommending the fracture clinic.

When asked about whether or not an additional clinical visit was desired the results of the survey were equally split. Half the respondents replied that they did not want an additional visit and the other half of the respondents replied they would have wanted an additional follow up visit.
The half that desired an additional clinical visit was also subdivided, in that three quarters of the respondents were not adamant about returning for an additional appointment due to being satisfied with the information provision, preferred to follow up with their family doctor, were satisfied with the healing and relieved to not schedule another appointment. Only one quarter of all the respondents were adamant about an additional follow up visit. Primarily, the need for an additional follow up visit, in this segment, stemmed from two main variables; unmet expectations and low information provision. When respondents have previously experienced a fracture where the follow up care did not include reduced clinical visits they are disappointed in what they perceived to be a different standard of care. As well, when participants were treated by medical students they felt less confident about the initial visit and were more insistent on an additional follow up visit.

The half of the respondents that did not want an additional follow up visit in the fracture clinic attributed it to being confident with the information provided by the medical professional and were deterred from returning to the clinic due to the multiple inconveniences they experienced. Primarily, the overall need for a second visit was largely affected by the perception the

respondents had about the level of pain their child experienced, and how they perceived the fracture to be healing.

In conclusion, although the area of patient satisfaction towards clinical pathways is new and under researched, this research sheds light on the benefits of determining patient satisfaction.

References:

[1]http://www.sickkids.ca/AboutSickKids/YearinReview/Inside-SickKids/Facts-and-Figures.html

The Effect of SIRT6 on Lipid Metabolism

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As scientists continue to make breakthroughs in modern science and in medicine, there have been many advances in extending human lifespan. However, with increased longevity, there has been a rise in age-related metabolic diseases such as hypertension and obesity. It has been proven that a calorie-restricted diet can slow aging and extend lifespan, though the mechanism by which this occurs is not fully understood. Professor Haim Cohen's lab focuses on the metabolic pathways that work to increase longevity and their relationship to the sirtuin family, a group of NAD+ dependent deacylases that have been shown to play an important role in the regulation of extended lifespan and healthy aging.

In previous experiments, Professor Cohen's lab has shown that SIRT6 is involved in regulating diet and metabolic pathways. When caloric intake was restricted in mice, SIRT6 expression increased. Mice deficient in SIRT6 had metabolic deficiencies, died prematurely and displayed aging-related phenotypes. Mice genetically altered to overexpress SIRT6 were found to have an extended lifespan when compared to normal mice, and they also appeared to have substantial improvement in their health as they aged. Research from Professor Cohen's lab has also implicated SIRT6 in regulating hepatic fat metabolism and beta oxidation, the process in which fatty acids are broken down during starvation. When both wild type mice and mice overexpressing SIRT6 were treated with WY 14,643, a specific PPAR activator that activates beta oxidation, it was found that the SIRT6 mice had altered beta oxidation genes, showing that SIRT6 interacts with PPAR in order to regulate beta oxidation.

Based on the findings that SIRT6 works with PPAR to play a role in metabolic pathways, we decided to further investigate the role of SIRT6 in the mechanism of beta oxidation. We cloned PPAR from mouse cDNA in order to engineer cells to overexpress the PPAR gene. Upon successful cloning and amplification of this gene, we genetically modified Hepa-16 liver cells via transfection to overexpress SIRT6, PPAR, and a PPAR-specific promoter (PPRE element).

To investigate whether the deacetylase catalytic activity of SIRT6 is required for its regulation of PPAR activity, we treated cells with WY 14,643 and measured PPAR-mediated gene expression in the treated cells via qPCR. We found that cells that overexpressed SIRT6 showed greater beta oxidation gene activation when compared to cells without SIRT6 or with a mutant catalytically dead SIRT6.

After seeing such a strong effect of SIRT6 on beta oxidation, we sought to investigate the mechanism by which SIRT6 regulates PPAR genes. We transformed cells with the normal or mutant SIRT6, and also transformed cells with PPRE fused to a luciferase gene in liver cells. We then utilized the dual luciferase assay to examine the activity of the PPRE in cells with wild type SIRT6, mutant SIRT6 and knockout SIRT6 in the presence or absence of PPAR (Figure 1). We expected to see greater PPRE activity in the presence of PPAR and SIRT6 than in the presence of PPAR alone. However, the results show that PPRE activity was greater in the presence of PPAR alone. SIRT6 appeared to inhibit the expression of the PPAR promoter-luciferase construct, indicating a novel mechanism for the activation of WY-dependent genes that is not PPRE dependent. More experiments are required for further analysis, but these results could shed light on a yet unknown mechanism used to burn fat.

These results and continued research hold promise in using SIRT6 as a drug target to prevent metabolic diseases and to promote healthy aging.

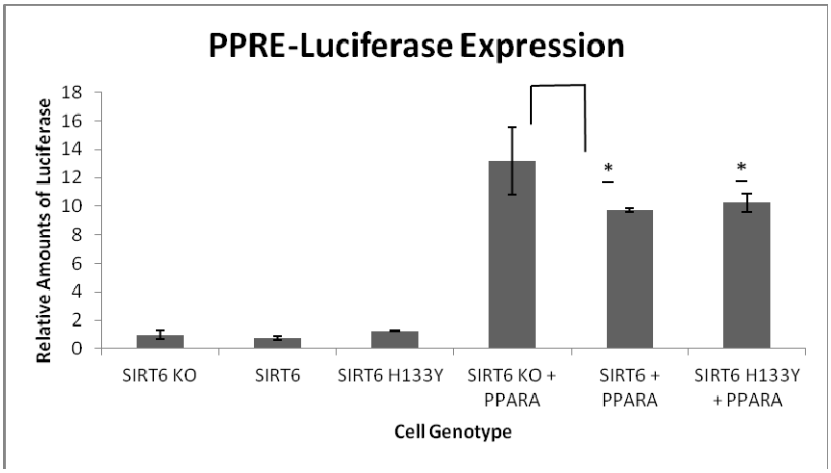

Figure 1. PPRE activity increases in the presence of PPAR. In the presence of PPAR and either SIRT6 or mutant SIRT6, PPRE activity increases, but is somewhat inhibited.

Observing Apoptosis by Means of Fluorescence Lifetime in Coated Gold Nanoparticles

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Gold nanoparticles (GNPs) and gold nanorods (GNRs) have been shown to have a variety of diagnostic and therapeutic applications in the treatment of cancer. Gold nanoparticles are non-toxic and the high density of gold makes GNPs an excellent contrast agent for x-ray and CT scanning. Using GNPs as a contrast agent is particularly helpful in that it allows tumors to be imaged even when there is no large structure present. This allows very small tumors to be detected by CT, which can help medical professionals to detect and treat remaining cancerous cells after surgery.

Another possible application of GNPs to cancer diagnosis and therapy is using them to ascertain when cells undergo apoptosis[1]. In our experiment, GNPs with a diameter of approximately 20 nm were fabricated. The success of the fabrication was confirmed by spectrophotometric methods. 90% of the surface of the GNPs was then coated with linkers attached to the glucose. Since cancerous cells have increased metabolic activity, they take up the glucose-coated GNPs more readily than regular cells[2]. 10% of the surface was coated with linkers which contained fluorescein at the end and which were conjugated with a caspase-sensitive peptide (DEVD).
The theory behind the experiment is that when fluorophores are within 40 nm of GNPs, the electric field of the GNP changes the fluorescent lifetime of the fluorophores. When the DEVD peptide is cleaved by caspase-3, the original fluorescent lifetime of the fluorophores is observed. Fluorescence-lifetime imaging microscopy (FLIM), which uses a laser to excite fluorescent particles, was used to observe changes in fluorescence lifetime (see Figure 1).[3]

Unfortunately, neither the coated GNPs with caspase added to them nor coated GNPs which were examined in cells in which apoptosis was induced showed any change in fluorescence lifetime. Therefore, results are inconclusive at the time of this writing.

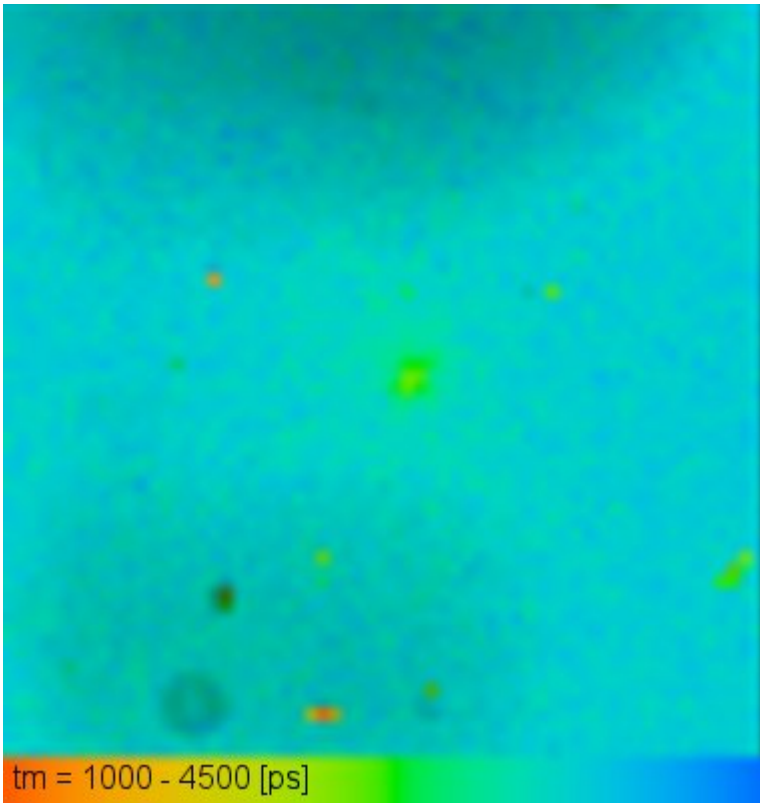

Figure 1. Sample of coated GNPs imaged using FLIM

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Resistance to Tamoxifen in Breast Cancers with Hyper-Activation of mTORC1

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Over two-thirds of breast cancers are positive for the estrogen receptor ERα. Binding of estrogen to its receptor initiates a series of events that promote cell proliferation and growth. Normally, endocrine therapy is used to treat ERα positive breast cancers to inhibit estrogen activity. Tamoxifen, a commonly used anti-estrogen, is a competitive inhibitor of estrogen receptor.

Unfortunately, many patients develop resistance, either *de novo* or acquired, when treated with long-term endocrine therapy, which in some cases is due to hyperactivation of the mTOR (mechanistic target of rapamycin) pathway. The mTOR pathway circumvents the estrogenic activation of ERα and promotes cancerous cell proliferation.

By analyzing the mode of action of tamoxifen and the development of the resistance, new treatments can be developed and implemented. We generated tamoxifen resistant ER-positive MCF7 breast cancer cells by treatment with tamoxifen for two monthsr. A cytoplasmic and nuclear fractionation was performed to analyze the molecular changes associated with tamoxifen resistance. The results showed that expression and/or activation of proteins involved in the mTOR pathway increased in these cells. For example, an increase in levels of nuclear Raptor (regulatory associated protein of mTOR) which is critical in mTOR pathway activity, was found in these cells. This could promote estrogen independent ERα activity. These results show that tamoxifen resistance is associated with hyper activation of mTOR signaling in breast cancer cells.

The Blood Libel and Bacteria: Using Microbiology to Uncover an Incendiary Accusation Against the Jews

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The blood libel was a notorious accusation, which claimed that Christian children were abducted and murdered by Jews who collected their blood for use during Passover and other rituals. The book, "*Europe and the Jews*," authored by Malcolm Hay, presented situations wherein Jews were blamed for the murder of Christian children after finding "blood" on the wafers used during church services. The author suggested that the wafers' bloody red appearance was due to growth of the red-colored bacterium, *Serratia marcescens*.

The hypothesis postulated by Hay seemed unusual, in that bacteria generally prefer growth media rich in proteins and poor in carbohydrates (*e.g.*, tryptic soy broth (TSB)), whereas the wafer was rich in carbohydrates and poor in protein. Growth media high in carbohydrates and poor in protein (*e.g.*, Sabouraud dextrose broth (SDB)) are used to grow yeast. A study was performed to evaluate the relative growth of the red-pigmented bacterium, *S. marcescens*, and two red-pigmented yeast, *Saccharomyces cerevisae* and *Rhodotorula rubra*, in a synthetic medium using matzah, in place of the wafer, as the nutrient source. Matzah is carbohydrate-rich and protein-poor. The intent of this experiment was to test Hay's hypothesis that the blood libel accusation may have been based upon growth of *S. marcescens* on the wafer and to evaluate whether this coloration may also have been caused by growth of red-pigmented yeast.

Bacteria were grown in TSB and the yeast in SDB for 48 hr, after which the microbes were centrifuged and resuspended in PBS to an O.D. reading at 550 nm of 0.3. Thereafter, 50 µL of each microbe suspension was inoculated in a matzah-supplemented broth, consisting of 2.5 and 5 grams of matzah in 100 mL PBS and incubated with aeration at 28 °C for 48 hr. Thereafter, growth was determined spectrophotometrically. Interestingly, whereas growth was noted for each microbe, a vibrant red coloration was noted only in the broth inoculated with *S. marcescens* (Figure 1).

Figure 1. Growth of *S. marcescens* in medium amended with 2.5 and 5 grams/100 mL matzah; the flasks containing the yeasts (not shown) appeared very similar in color to the first flask (C = control), which was uninoculated.

Studies were performed on the growth of these microorganisms on PBS-soaked matzah. The microbes were grown as noted above and thereafter were inoculated directly upon the matzah, housed in a Petri dish. As noted in the broth studies, all microbes grew, but only *S. marcescens* produced a red pigmentation, which resembled the color of blood; the yeasts, however, produced a faint pink color (Figure 2). When grown on Sabouraud dextrose agar (SDA), both yeasts produced a red pigmentation.

Figure 2. Growth of microbes on PBS-soaked matzah.

The results showed that *Serratia marcescens* grew and produced a vivid red color, while the two yeasts grew but did not turn the matzah red. Both yeasts, which were able to produce red pigments when grown on SDA, failed to do so in the presence of matzah-based carbohydrates, producing only a very faint pink color. The coloration was not nearly as vibrant as the *Serratia marcescens* whose growth and color closely resembled that of blood.

The studies herein confirmed Hay's hypothesis that a wafer (or, in this study, a piece of matzah) contaminated (or, inoculated, as herein) with *S. marcescens* would develop a blood-like coloration. Whether or not this was the cause of the blood libel still remains to be determined.

Hypoxia shows increased GABA in Mouse Prefrontal Cortex

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Obstructive sleep apnea, a sleep disorder known to cause airway blockage and inability to breathe, has been associated with a decrease in Gamma-aminobutyric acid (GABA) measured in the prefrontal cortex of the human brain, a region associated with cognitive function. This study aimed to obtain a fuller understanding of the mechanisms behind the human finding by investigating GABA content in the brains of hypoxic mice. Because hypoxia is one of the major symptoms in obstructive sleep apnea, chronic intermittent hypoxic mouse models are often used to study aspects of obstructive sleep apnea.

Hypoxia is the deprivation of a sufficient oxygen supply to the tissues of a living organism. While it is evident that oxygen deficiency has an impact on the amount of GABA found in the brain, there is a great deal of conflict within the current literature on the topic. Some studies show an increase in GABA in brain regions of hypoxic animal models, while other studies display the reverse.

GABA is one of the major inhibitory neurotransmitters of the central nervous system, serving to limit neuronal activity within the cell. Glutamate is the excitatory neurotransmitter which stimulates neuronal activity. The two regulate each other to form a stable environment for brain activity. A lack of GABA causes neurons to release signals more frequently and erratically. A subset of GABAergic neurons contain the calcium binding protein parvalbumin.

To investigate the GABA in the prelimbic and infralimbic regions of the prefrontal cortex of mice with hypoxia, this study looked at young males with severe (5%) chronic intermittent hypoxia (CIH) and older males with moderate (10%) CIH. Using these models, the study examined the effects of both age and severity of oxygen deprivation, respectively, on GABA expression.

Through immunohistochemical analysis, GABA and parvalbumin cell bodies were labeled in the prefrontal cortex of both cohorts. A blinded experimenter counted cell bodies in both the prelimbic and infralimbic regions of the prefrontal cortex. Additionally, densitometry studies of GABAergic terminal fields were performed on the four layers of both the prelimbic and infralimbic regions. Both experiments showed an increase in GABA in the cell bodies and processes of the CIH male mice. No change in the number of parvalbumin-containing neurons was found.

In order to investigate a possible inability to excrete GABA into the synapses, brain sections were then labeled with vesicular GABA transporter (V-GAT) through immunohistochemistry. V-GAT marks axons and terminals containing GABA which will be brought to the synapses. Densitometry analysis of V-GAT showed V-GAT higher in the prefrontal cortex of both the moderate and severe CIH mice compared to the control groups.

These findings may be the effect of a compensatory mechanism for hypoxia induced hyperexcitability. In order to further understand the mechanism, future testing will focus on female cohorts to compare the effects of gender on hypoxia.

The Role of Double Negative $CD4^-CD8^-$ T cells in Pancreatic Adenocarcinoma Progression

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Pancreatic ductal adenocarcinoma (PDA) is the third leading cause of cancer-related deaths in the United States. The long term survival is about 4% despite the current surgical and chemotherapeutic modalities. In recent times, immunotherapy, which involves modulating the immune system to combat cancer has shown enormous promise of survival to this disease with grim prognosis. However, the role of the major leukocytic cellular immune players is largely unknown. The adaptive immune system which includes conventional $CD4^+$ and $CD8^+$ T leukocytes are the main effector cells in the tumor microenviroment that confer tumor protection. Some subsets of $CD4^+$ T cells mediate tumor protection by activating cytotoxic $CD8^+$ T cells, which in turn have direct tumorical actions in an antigen restricted manner. However, the role of unconventional double negative $CD4^-CD8^-$ T cells is PDA is presently unknown.

Double negative $CD4^-CD8^-$ T cells are defined as having the αβ T cell receptor (similar to $CD4^+$ and $CD8^+$ T cells) but lack CD4 and CD8 co-receptors . In melanoma, these antigen-restricted $CD4^-CD8^-$ double negative T cell subset (DNTs) have been shown to have direct cytotoxic effects on tumor cells. Given what is known about the tumor protective properties of DNTs in the melanoma literature, we hypothesized that DNTs confer similar protection in the PDA. To investigate this, we employed an invasive orthotopic model of PDA by injecting pancreatic tumor cells derived from $Pdx1^{Cre};Kras^{G12D};Tp53^{R172H}$ (KPC) mice which express both mutant Kras and p53 into wild type C57BL/6 mice. These pancreatic tumors were harvested at 21 days post injection and studied through flow cytometric analysis. Our preliminary data showed that these DNTs are recruited more abundantly to the tumor microenviroment in PDA than in the spleen (Figure 1). They also exhibit a highly activated effector phenotype $CD44^+$ $CD25^+$; express co-stimulatory molecules such as CD28, Lag-3, PD-1, CTLA-4 and activating ligands. They also express activating cytokines including IFNγ and TNFα. Additionally, they express cytotoxic properties CD107a and perforin (Figure 2; CD44, IFNγ, CD107a shown, other markers not shown). Interestingly, adoptive transfer of pancreatic tumor entrained DNT cells co-injected with KPC derived tumor cell line subcutaneously into recipient wild type mice, conferred significant tumor protection compared to controls that received tumor alone (Figure 3).

In summary, we have discovered a novel effector T cell subset that confers remarkable tumor protection in PDA. Further direction involves multiple

experiments investigating the mechanism of action. The potential impact of this study is high as these cells may be an attractive target for experimental therapeutics in this devastating disease.

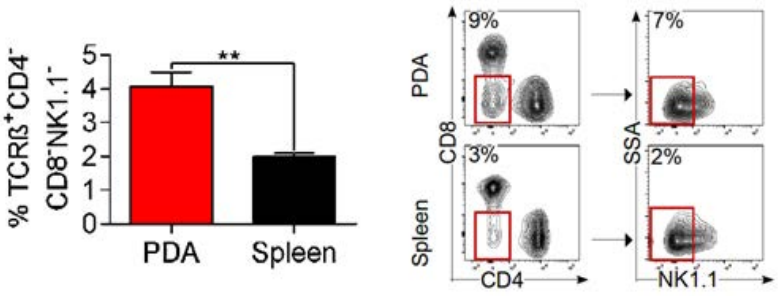

Figure 1: Double Negative T cells are unregulated in Tumor microenvironment. Flow cytometric analysis showing that DNT's are highly recruited to tumor microenvironment.

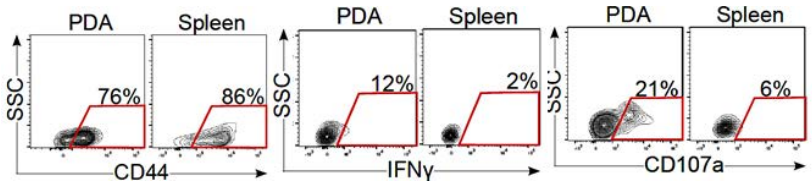

Figure 2: Double negative T cells are a highly activated T cell subset in the tumor microenvironment. Flocytometric analysis showing high CD44, IFNγ and CD107a expression. Other markers not shown but listed in the text.

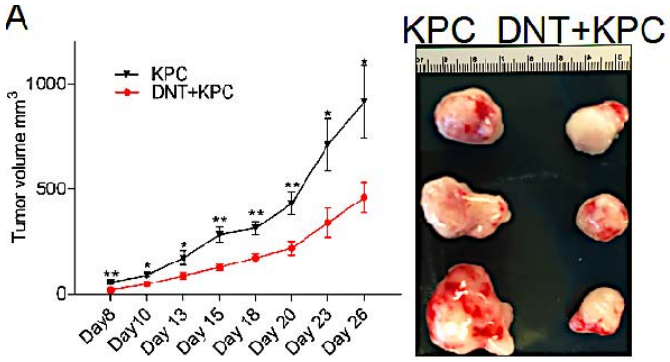

Figure 3: Double negative T cells confer pancreatic cancer tumor protection. Adoptive transfer of tumor entrained DNT's co-injected with pancreatic cancer tumor cells subcutaneously in mice shows smaller tumor volumes compared to control.

The Role of IL-17a on Fecal Microbiota Transplant-Mediated Clearance of *C. difficile* Infection

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Clostridium difficile, a prevalent hospital-acquired pathogen, is an urgent public health threat that is estimated to infect half a million people and cause 20,000 deaths in the United States annually[1]. This anaerobic, gram-positive bacteria spreads through spores and infects the gastrointestinal tract, causing severe diarrhea and intestinal inflammation. The spores can germinate in the large intestine into the vegetative form of the bacteria, which produces toxins that damage intestinal epithelial cells, leading to destruction of the gut barrier. Commensal bacteria residing in the gastrointestinal tract, termed the intestinal microbiota, provide protection for the host against pathogens such as *C. difficile*, either by outcompeting pathogens for nutrients or by modulating the host's immune response to pathogens. Exposure to antibiotics depletes intestinal commensal bacteria, resulting in dysbiosis of the microbiota, thereby creating an environment suitable for *C. difficile* to proliferate. Current hospital protocols call for administration of antibiotics to treat *C. difficile* infection (CDI). However, antibiotic treatment maintains intestinal dysbiosis resulting in recurrence of disease in 10-35% patients[2]. Recent studies demonstrate that fecal microbiota transplantation (FMT) is a viable alternative treatment for cases of recurrent CDI. By transplanting the feces of a healthy patient into a patient with reduced gut microbial diversity, an FMT restores a healthy gut microbiota. Despite an approximately 90% efficacy rate in preventing recurrent *C. difficile*[3], the exact mechanism of FMT-mediated clearance is undefined.

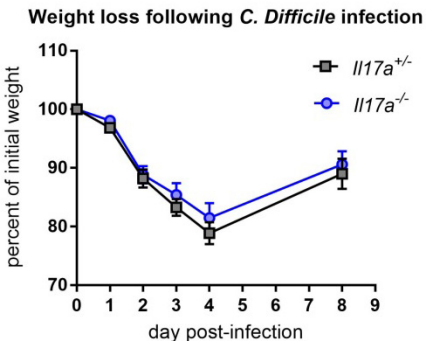

Figure 1: Mice were infected with 200 spores of *C. difficile* (CD196 strain) and monitored for weight loss following infection. n = 8-9 mice per group. Data representative of two independent experiments.

Commensal bacteria from FMT interact with the host's intestinal immune system and regulate expression of several effector molecules critical for host defense against CDI. We hypothesize that the interplay between the FMT and host's immune system is important in determining the efficacy of FMT-mediated clearance of

CDI. Using a murine model of CDI, this study assessed the role of a specific immune molecule, IL-17a, in FMT-mediated clearance of CDI. Expression of the inflammatory cytokine IL-17a is regulated in the intestine by commensal bacteria and induced following CDI; however, whether IL-17a supports or hinders FMT-mediated clearance of *C. difficile* infection is undetermined.

Antibiotic pre-treated IL-17 knockout (*Il17a*$^{-/-}$) and littermate-control IL-17 heterozygous mice (*Il17a*$^{+/-}$), were infected with *C. difficile*. Both groups displayed CDI phenotype characterized by acute weight loss and recovery following infection (Figure 1). Two months after infection, *C. difficile* persisted in the colon of mice in both groups (Figure 2A). Mice received an FMT from uninfected C57BL/6 mice or PBS as a control. Fecal samples were subsequently collected every 3-5 days post-FMT, re-suspended in PBS, serial diluted, and plated anaerobically on selective media for growth of *C. difficile*. Colony forming units (CFU) of *C. difficile* were calculated after overnight incubation. At day 22 post-FMT, the mice were sacrificed and the cecal content was collected to determine final *C. difficile* burden. Supernatants of fecal samples were also collected to assay for *C. difficile* toxin.

Il17a$^{-/-}$ and *Il17a*$^{+/-}$ mice treated with PBS maintained high *C. difficile* burden throughout the course of the experiment. In contrast, *Il17a*$^{-/-}$ and *Il17a*$^{+/-}$ mice treated with the FMT exhibited a 1-2 log-fold decrease in *C. difficile* colonization as early as four days after treatment (Figure 2A). By day 22 post-treatment, FMT treated *Il17a*$^{-/-}$ and *Il17a*$^{+/-}$ mice had significantly reduced *C. difficile* burden (Figure 2B) and toxin (Figure 2C) compared to PBS treated control mice, yet there was no difference in *C. difficile* clearance between FMT treated *Il17a*$^{-/-}$ and *Il17a*$^{+/-}$ groups. These results demonstrate that FMT-mediated clearance of *C. difficile* is independent of IL-17 expression.

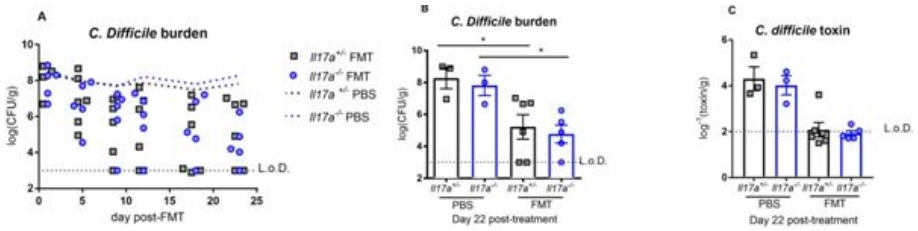

Figure 2: (A) *C. difficile* CFUs in fecal pellets of *Il17*$^{+/-}$ and *Il17*$^{-/-}$ mice following FMT or PBS treatment (B) *C. difficile* CFUs in cecal content at day 22 post-treatment (C) Toxin levels in cecal content of *C. difficile* infected mice at day 22 post-treatment * = $p < 0.05$. n = 3-6 mice per group. Data representative of two independent experiments.

Interestingly, some FMT treated mice from both the *Il17a*$^{-/-}$ and *Il17a*$^{+/-}$ groups remained infected with *C. difficile* at levels similar to those exhibited by PBS-treated mice (Figure 2A,B). Future analyses will sequence bacterial DNA from frozen fecal samples collected before and after FMT. Sequence analysis will identify differences in the bacterial populations of mice that failed to respond to FMT and could yield insights into the conditions needed for FMT-mediated clearance.

Elucidation of the mechanism of action of FMTs will lead to improved treatment approaches. Once the specific bacteria species that confer the ability to clear *C. difficile* from the gut are identified, such bacteria can be extracted from fecal matter or grown separately, and administered as a purified therapeutic. Additionally, modulation of the immune molecules involved in the interplay between bacteria and the host immune system has the potential to enhance efficacy of FMT therapy.

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Developing Virtual Reality Stimulation Technologies to study Natural Speech Processing

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Traditionally, neurological experiments have used discrete stimuli such as pictures, sounds, light signals, etc. to study neural responses and processing. Although the use of discrete stimuli creates a well-controlled setting for an experiment, the setting remains an artificial, unnatural setting, in which the participant is subject to a limited amount of stimuli per time unit. These settings are very different from our own busy and noisy environment, in which we encounter many stimuli simultaneously. Thus said, the Golumbic lab focuses on studying neural mechanisms in more natural settings that are closer to these real-life situations.

Common stimuli used in experiments to maintain a near natural setting are audiovisual filmed clips, which can be shown on a computer screen to participants. However, this mechanism is difficult to manipulate and does not lend itself to multiple circumstances. It is difficult to create a completely natural setting that can be easily controlled.

My lab has focused on using advanced technological tools, such as virtual reality, to create natural, real–life stimuli that can be easily manipulated and configured according to the experimenter's goals. Specifically, we want to be able to manipulate these stimuli to study how eye contact, body position, voice volume, distractions, and other factors affect brain processes. We can also track a subject's eye movement, to monitor where the subject is focusing his attention throughout the course of the study.

My project throughout the summer was to create part of these virtual reality stimuli through the use of a 3D development environment program, Unity 5.3. With this program, I lip synced audio files to an animated avatar, "teaching" the avatar to move his mouth in sync with the audio clip by attaching Hebrew phoneme markers which the lab had developed to a series of fifty WAV sound files (Figure 1). Phonemes are distinct units of sound that distinguish one word from another, for example the *o*, *r* (throat reish), *ch* (throat chet), and *s* (samech or sin*)*. In Unity, each of these phonemes were matched with particular mouth movements, for example the *o* phoneme will make the avatar have rounded, open lips and mid-mouth to the left and right (Figure 2), the *ah* phoneme will make the avatar have open, wide lips (Figure 3), and the *m* phoneme will make the avatar have closed lips and slightly puffed cheeks (Figure 4). Now, when played back, the avatar can speak in sync with the audio file.

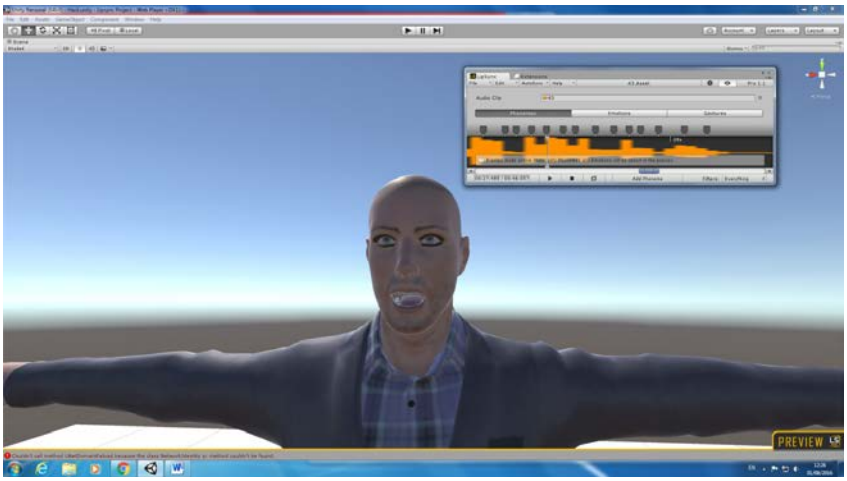

Figure 1: Avatar alongside the WAV audio file with the Hebrew phoneme markers

Figures 2, 3, and 4: Avatar "saying" the *o* , *ah*, and *m* phonemes, respectively.

Analysis of Oxycodone in Urine by LC/MS

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Urine drug testing is an essential tool in pain management that provides objective information to assist in diagnostic and therapeutic decision making. The presence of an unprescribed drug may suggest drug abuse or addiction. Urine is the preferred biologic specimen for determining the presence or absence of drugs due to the increased window of detection (1-4 days for most drugs and their metabolites). Oxycodone, a very popular opiate, is a semi-synthetic derivative of codeine which acts as an analgesic (Figure 1). It is more potent and addictive than codeine.

Oxycodone works by binding to mu, kappa and delta receptors in the central nervous system, inhibiting adenylyl cyclase and hyper-polarization of neurons, and decreasing excitability. Oxycodone alters the perception of pain at the spinal cord as well as the emotional response to pain. Most of the drug is metabolized in the liver, while the rest is excreted with its metabolites by the kidney. The two main metabolites of oxycodone are oxymorphone, a potent analgesic, and noroxycodone, a weak analgesic. The retention time of oxycodone is 2-4 days, depending on the patient's metabolism. Oxycodone is administered orally, intranasally, intramuscularly, by subcutaneous injection, or rectally.

A sensitive, rapid, simple liquid chromatography/mass spectrophotometry (LC/MS) method was used to analyze oxycodone and its metabolites. Urine samples were hydrolyzed by enzymatic cleavage. The hydrolyzed samples were then diluted and injected into a Shimadu 20 A HPLC system, which consists of a solvent delivery module (pumps A and B), autosampler, column oven, and system controller. The ABSciex-Triple Quadrupole System consists of ion optics that transfer the ions to the first quadrupole (Q1), to the collision cell (Q2), and then to the third quadrupole (Q3). The ion is then sent for fragmentation. The analyst software was then used to quantitate the amount of oxycodone and/or its metabolite oxymorphone. The quantitation method was then created with an algorithm which generated quantitation tables. Integration of the peaks, regression and linearity of the calibration curve, and accuracy of the controls were reviewed and verified.

LC/MS was used to analyze urine samples of patients. The calibrators and the internal standard show that oxycodone has a retention time of approximately 2.98 minutes (Figure 2). Anything that shows a peak that is not at this retention time is negative. The concentration of Oxycodone or its metabolites is determined by the area under the curve and where the patient's sample lies on the calibration curve. The highest calibrator is Cal 5 which is

5000 ng/mL. If the patient has more than 5000 ng or falls outside this curve the results show >5000 ng/mL. Patient samples that are positive for Oxycodone have a retention time that matches the internal standard peak (Figure 3). The cutoff for oxycodone is 50 ng/mL—any sample below this cutoff is also considered to be negative (Figure 4).Our research assists doctors in finding the best treatment plan for their patients and assists doctors to determine if their patients are taking any other medications or abusing illegal drugs.

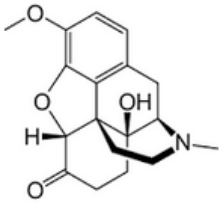

Figure 1. Chemical structure of Oxycodone.

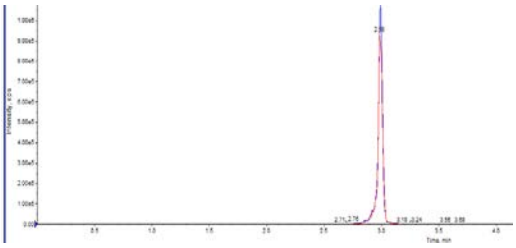

Figure 2. Retention time of Oxycodone.

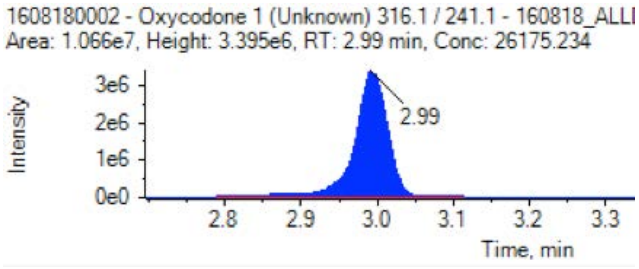

Figure 3. Patient sample that is positive for Oxycodone. Concentration of Oxycodone found is 26,175.234 ng/mL.

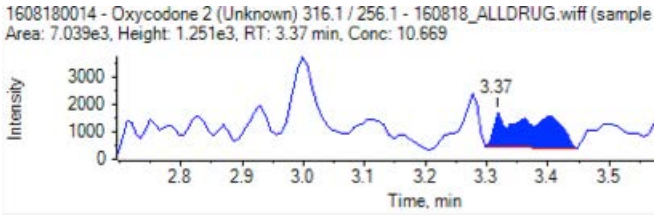

Figure 4. Patient sample that is negative for Oxycodone. Concentration of oxycodone found is 10.669 ng/mL and retention time peak is at 3.37 minutes.

Regulation of EHD Proteins by PKC Phosphorylation

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Acute myocardial infarction secondary to myocardial ischemia remains the number one cause of morbidity and mortality in the United States and is responsible for 220,000 deaths each year. Among patients who survive an infarct, the major determinant of the long-term prognosis is the amount of myocardium destroyed as a result of ischemic injury (the size of infarction). This project investigated the KATP channel and its role in protecting the heart against ischemic injury. These studies were driven by our observations that alterations in KATP channel trafficking during ischemia/reperfusion (I/R) and ischemic preconditioning (IPC) contribute to their protective effects. Under physiological conditions KATP channels undergo continuous, rapid endocytosis and are constitutively recycled back to the surface. Ischemia, in contrast, promotes internalization of KATP channels, which reduces the pool of surface channels available for cardioprotection. Significantly, IPC prevents ischemia-induced internalization of KATP channels. Moreover, the protective benefits of IPC on infarct size are abolished in mice with cardiac-specific knockout of the KATP channel subunit, Kir6.2. These observations led to the hypothesis that alterations in KATP channel subcellular trafficking participate in the protective mechanisms of ischemic preconditioning. We investigated the cellular mechanisms and signaling pathways responsible for KATP channel subcellular trafficking to understand the role of subcellular trafficking in cardioprotection.

Our preliminary data demonstrated that maintenance of surface KATP channels is an important mechanism for IPC. We showed that PKC activation is required for IPC to maintain robust KATP channel surface expression, consistent with previously published data that demonstrated a protective role of PKC. A common assumption is that sarcolemmal KATP channels are uniform and that surface expression is static in cardiac myocytes. Given the cardioprotective nature of KATP channels, dynamic changes in their surface density represent a potentially powerful defensive mechanism against stress. The molecular and cellular mechanisms involved in regulating KATP channel surface density, and how they are influenced by disease states, are largely unknown.

Although trafficking proteins have been studied for decades, little is known regarding their regulation by molecular signaling (such as by PKC). A recent study has shown that Rab11 is phosphorylated by classical and novel PKC isoenzymes. Driven by this observation, and given the roles of EHD2 and PKC in KATP channel trafficking, we investigated whether EHD proteins

might be PKC targets. With a bioinformatics approach, EHD2 was identified as a PKC phosphoprotein.

Our proteomic experiments and preliminary data signified a key role for the C-terminal EH-domain family of proteins as trafficking regulators. Specifically, EHD2 plays a key role in stabilizing KATP channel surface expression. The hypothesis put forth was that PKC signals via EHD2 regulate KATP channel surface density. We investigated mechanisms by with KATP channel subcellular trafficking was affected by PKC signaling. Presently, we are examining KATP channel surface expression, subcellular distribution, and rates of endocytic recycling in HEK-293 cells expressing Kir6.2/SUR2A together with constitutively active or kinase-dead DN PKCε, PKCδ, and PKCα. The HEK-293 cells were transfected with Kir6.2 and SUR2A together with PKCε, PKCδ, and PKCα active and dominant negative PKCε, PKCδ, and PKCα. We hypothesize that the DN PKC's should be inhibitory, regardless of the amount of endogenous activity. This will be proven through cell surface biotinylation assays.

While still in the midst of the study, the results look very promising. The first biotinylation assay performed showed that the HEK-293 cells expressing Kir6.2/SUR2A together with active PKCε increased surface channel density two-fold, as compared to cells with only Kir6.2/SUR2A and/or with both Kir6.2/SUR2A and DN PKCε.

Trichodesmium Efficacy in Oligotrophic Waters

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Fixation of atmospheric dinitrogen introduces a bioavailable form of nitrogen into nitrogen-poor surface waters of the ocean providing an essential component for organisms at the base of aquatic food webs. Blooms of *Trichodesmium*, a planktonic marine cyanobacterium, are responsible for 25 to 50% of marine and global nitrogen cycling and therefore essential for promoting marine life growth. The unique habitat resultant of *Trichodesmium* blooms lead to a complex assemblage of microzooplankton, where nutrient transformation and exchange can take place.[2] *Trichodesmium* can exist as single trichomes or colonies, which determines the efficiency of the associated microbe community[2].

Oligotrophic bodies of water, such as the Gulf of Aqaba, lack inorganic nutrients. Diazotrophic (nitrogen fixing) organisms are especially sensitive to iron (Fe^-) and phosphate (PO_4^-) concentrations at surface level. Therefore, the effect of Fe^- and PO_4^- limitation on *Trichodesmium* colony formation was investigated. We subjected two samples of *Trichodesmium* to Fe^- deplete media and compared cell count and colony formation to a control sample (non depletion). It was found that Fe^- deficiency has a high influence on colony formation after 48 hours (Figure 1). The same was done with PO_4^-, and the results suggest that while PO_4^- deficiency induces colony formation, Fe deficiency affects colony formation much more rapidly (48 hours versus 6 days).

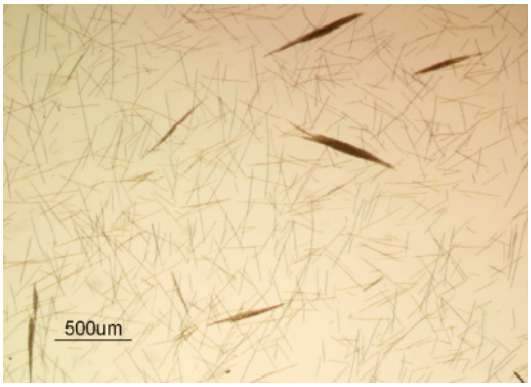

Figure 1. Trichomes and colonies in Fe depleted media.

Another objective was to study the unique environment of the Gulf of Aqaba and predict possible repercussions of environmental change. As part of this ongoing study, sea-water samples from various depths were profiled for chemical and physical properties and then tested for nitrogen and carbon fixation rates. As a follow-up to that project, the samples will be analyzed for diazotroph identification.

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The Broad Domain of Vascular Access- A Kidney Transplant Surgeon's View

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Background: While waiting for a kidney transplant, patients with End Stage Renal Disease (ESRD) generally require dialysis. Though various methods of dialysis exist, many choose hemodialysis, requiring creation of an arteriovenous (AV) fistula. Because this is a field of medicine and surgery, the transplant surgeons are involved in patient care from the start of the evaluation process. This paper proposes that it is transplant surgeons, and not those of other specialties, who are best suited to perform the access surgery on ESRD patients because of their intricate involvement in their patient's care.

Methods: A survey was sent out via e-mail, using the program survey monkey, to the heads of 67 kidney transplant programs about the current stakeholders in the creation of fistulas in their programs, as well as their opinion about whom is best suited for perform angioaccess procedures.

Results: Survey results indicate that currently, there are only 22.45% of access surgeries being done by transplant surgeons. In addition, there is an extreme lack of exclusively kidney transplant surgeons performing access surgery, with only 8 out of 27 programs having all of their transplant surgeons doing access as specifically *kidney* transplant surgeons. 17 out of 27 programs have 100% of their access surgeons as transplant surgeons, but those programs in which this is not the case have a very low percentage of their access surgeries done by transplant surgeons. Only 10 out of 27 hospitals have 75% or above of their surgeries performed by transplant surgeons. Other questions were asked and the results were supplementary in formulating the conclusion highlighting the need to increase transplant surgeon involvement in care for ESRD patients.

Discussion: The low number of transplant surgeons performing the access surgery at each center highlights the various stakeholders involved in ESRD patients' care and indicates the transplant surgeons' lack of involvement in the vascular care of the patient, despite their vast knowledge about the health of the patients. Based on our findings, kidney transplant programs have long ways to go in emphasizing the importance of their transplant surgeons' involvement in performing the patients' access surgeries. Ultimately however, the overwhelming majority of transplant programs believe it is best for the kidney transplant surgeons to be performing the access surgeries despite their current lack of action. Due to their intricate involvement in the

patient’s overall care, kidney transplant surgeons have the most holistic view of the patient’s well being when determining the necessity of access surgery.

The Effects of T232P Cancer Mutation in BAF180 on its Association with Chromatin

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The chromatin remodeling complex PBAF is a multi-subunit transcription factor found in mammalian cells. PBAF remodels nucleosomes to maintain cellular homeostasis and regulate transcription of the genome. This chromatin-remodeling complex is highly mutated in many cancers, including clear cell Renal Cell Carcinoma (ccRCC). BAF180 is a chromatin-targeting protein encoded by the *PBRM1* gene. BAF180 is a subunit within the PBAF complex and acts by binding to chromatin to promote centromere cohesion and genomic stability. BAF180 has six bromodomains, which bind to acetylated lysine residues and are thought to localize the PBAF complex to specific chromatin sites.

Our research will investigate the T232P cancer-derived missense mutation in the second bromodomain of BAF180. The T232P mutation is hypothesized to inactivate BAF180's second bromodomain, which may compromise DNA damage responses and lead to genomic instability. The mutation inserts a proline amino acid instead of threonine, causing an unfolding of the second bromodomain's alpha helix structure revealing potential protease cleavage sites. When we express T232P mutated BAF180 in U2-OS cells, the T232P mutation results in a truncation in BAF180 following the third bromodomain. We also found that this mutant did not associate with the rest of the PBAF complex. Specifically, the truncated protein product fails to interact with the BRG1 motor ATPase subunit within the PBAF complex, while still maintaining functional bromodomains one and three that can interact with chromatin.

We hypothesized that this truncated mutant T232P BAF180 would have altered interactions with chromatin in vivo. Surprisingly our Single-Particle Tracking (SPT) imaging assays showed that the BAF180-T232P mutant interacted with chromatin longer than wild-type BAF180. The extended interaction with chromatin leads us to question whether the T232P mutation or the BAF180-T232P mediated truncation is relevant to the alteration of chromatin binding. To test these theories, we wanted to generate artificially truncated wild-type and T232P mutant BAF180 expression vectors and perform SPT imaging.

We succeeded in creating a truncated WT BAF180 protein through PCR and cloning techniques. SPT imaging indicated that the truncated BAF180 protein still binds to chromatin with residence times similar to the WT BAF180. This suggests that the longer residence time of the T232P cancer mutant BAF180 protein may be related to the mutation on bromodomain 2,

and not due to the truncation itself. We then genetically truncated the T232P mutant BAF180 protein and found that its residence times were shorter than the T232P protein that was not artificially truncated. This may suggest that the C-terminus of the T232P mutant BAF180 protein is necessary for its enhanced stable binding to chromatin. In the future, we will mutate the proposed cleavage site on BAF180 protein to confirm the truncation site and determine the chromatin binding activity of full length T232P BAF180. Investigating the effects of the T232P mutation on BAF180 binding to chromatin may lead to further discoveries in the field of tumorigenesis.