Women in Science

2014–2015

Vol. XI

Yeshiva University
STERN COLLEGE FOR WOMEN

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Acknowledgments

We would like to thank the many people involved in *Women in Science*:

Dr. Harvey Babich, Dept. Chair of Biology at Stern College for Women, for inspiring the creation of this publication.

Dean Karen Bacon, the Dr. Monique C. Katz Dean of Undergraduate Arts and Sciences, for her support of the many programs and opportunities described herein that continue to empower Stern women in their pursuit of the sciences.

The student authors included in the *Abstract Booklet of Student Research* for their dedication to science research.

Ms. Meirah Shedlo for the layout of the publication.

The publishing company, Advanced Copy Center, for production of a quality journal.

Mr. Shmuel Ormianer for the cover design of this publication.

Introductory Remarks

The Departments of Biology, Chemistry/Biochemistry, Physics, and Psychology, 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, 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, and Physics 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. During the summer, laboratories at Albert Einstein College of Medicine (AECOM) and Montefiore Medical Center provide additional undergraduate research opportunities. 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 2015, 16 SCW undergraduates participated in this program. Summer internship opportunities for science students of all majors are available at the world-renowned facilities of the Brookhaven National Laboratory (BNL) and the New Jersey Institute of Technology (NJIT), through collaborative research of YU, BNL, and NJIT. The science faculties actively encourage the science majors to apply for competitive undergraduate research internships, locally, nationally, and internationally. In the summer of 2015, more than 60 SCW students were involved in research at SCW, AECOM, Montefiore Medical Center, and at external research facilities, including at Sloan-Kettering Cancer Center, Mt. Sinai School of Medicine, Beth Israel Medical Center, the Health Careers Opportunity Program at the Rusk Institute for Rehabilitative Medicine, Winthrop Hospital, Novartis Scientific Summer Scholars Program, Hackensack Univ. Medical Center, Massachusetts General Hospital, CHOP research Institute Sumer Scholars Program (Philadelphia), University of Chicago, Blood Center of Wisconsin, and CReATe Fertility Center (Univ. Toronto).

The Jewish Foundation for 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 an additional two cohorts of Fellows in the upcoming years. Highlights of the JFEW Science Fellowship Program include a partial scholarship, a stipend for a summer research internship, 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, Bar Ilan University, 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 and in industry, Citromax. Several of the JFEW students have taken leadership roles in forming the Neurobiology Club, the Genetics Club, and the Optometry Club. Graduates of the Program are currently pursuing careers in various science and health-related fields: medicine, dentistry, physical therapy, biomedical engineering, math education, food science, psychology, and veterinary medicine.

The 2015 'Summer Science Research Internship' program group on the Bar-Ilan campus.

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.

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.

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 and 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. These student-run clubs provide students with the opportunity to develop the social and professional skills needed to succeed in their future careers.

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 YU. 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.

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 2014-2015 academic year, the following students presented seminars at SURGE meeting:

	2014 FALL, SURGE Meetings	
September 2014		
Name	**Research Title**	**Program/Location**
Emily (Aliza) Chase	Anti-cancer Activity of a p300 Inhibitor and Trimeric in Head and Nech Squamous Cell Carcinoma Cells	Ohio State Univ., Wexner Medical Center
Rebecca Garber	Identification of a Therapeutic Window for a c-kit Inhibition to Extend Cardiac Regenerative Potential to Adolescence	Emory University
Adina Wakschlag	Microbial Production of Ethanol from Green Seaweed	Bar Ilan University
November 2014		
Name	**Research Title**	**Program/Location**
Rebecca Gross	The Cyclotron Production, Separation and PET/MR Imaging of the Radionucleotide Manganese-52	Washington University
Adi Cohen	Characterizing the Malaria Parasite *Plasmodium vivax*'s Equilibrative Nucleoside Transporter 1 and its Single Nucleotide Polymorphisms	Roth Scholar
Melissa Kramer	Drugged Wildlife: The Potential Impacts of Environmental Endocrine Disruptors on Reproductive Development	College of Charleston

December 2014		
Name	**Research Title**	**Program/Location**
Jackie Benayoun	The Role of IFNR-1 in African Patients with Malaria	Roth Scholar
Liat Weinstock	Carbapenem Resistant Gram-Negative Bacterial Infections in Solid Organ Transplant Recipients: A Case Control Study	Roth Scholar
Talia Felman	The Role of Peptide- and Peptidomimetic-based Cathepsin-C Inhibitors in Inhibition of Necrosis	Bar-Ilan University

	Spring 2015, SURGE Meetings	
February 2015		
Name	**Title**	**Research Program or University**
Esther Kazlow	Trafficking of Transporters Through the Hepatocyte; The Role of Organic Anion Transport Proteins 1a1 and 1a4	Roth Scholar
Bracha Robinson	Defining the Mechanism Through Which Obatoclax Kills Thyroid Cancer Cells	Roth Scholar
March 2015		
Name	**Title**	**Research Program or University**
Hadassa Holzapfel	Standardization of Trypan Blue Viability Assay for Cryopreserved-Thawed Hematopoietic Progenitor Cell Products	Roth Scholar
Elana Levy	Mammalian Ribosomes Associate *in vivo* with a Novel Intracellular Organelle	Columbia Univ. Medical Center
Bracha Robinson and Allison Tawil	The Effects of Apple Extract on Cancer Cells	SCW, Biology Dept
April 2015		
Name	**Title**	**Research Program or University**
Avital Shulman	The Role of Glycosylation in the Gamma-Glutamyltranspeptidase I Enzyme	Dept. Chem./Biochem., SCW

Shira Kaye	Investigation of the Interaction Between the p53 Tumor Suppressor and RNA Polymerase II Using Biochemical Analysis and Single Particle Cryo-Electron Microscopy	Roth Scholar
Alita Teitz	Relative Quantification of Undifferentiated and Differentiated Stem Cells Using Stem Cell and Neuronal Markers	Hebrew Univ. of Jerusalem

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 2015, Melissa Kramer (poster title**, "**The potential impacts of environmental endocrine disruptors on reproductive development") and Rebecca Gross (poster title, "Manganese-52: cyclotron production and PET/MR imaging') presented at the 249th National Meeting of the American Chemical Society, Denver, CO.

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 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 joint program with the NYU College of Nursing. Students interested in this program will pursue a shaped major that leads to the completion of the necessary prerequisites within five semesters for those who studied for a year abroad in Israel (or seven semesters for those who came 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 then 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"). 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 19). In the 2014-2015 academic year, the *Torah U'Madda* presentations, including talks by Dr. Itsik Pe'er, Ph.D., Sequence of the Ashkenazi genome," and by Yael Kramer, M.S., Research in fertility interventions: forging a path from bench to baby." The YU Medical Ethics Society and the YU Center for the Jewish Future, cosponsored a symposium, that included presentations by Rabbi Dr. Edward Reichman and Dr. Nicole Agus, "Testing for cancer risk in the Jewish community: medical and *halachic* perspectives," and by Rabbi Dr. Zalman Levine and Rabbi Kenneth Brander, "Oocyte cryopreservation: freezing eggs, new technologies to help single women and cancer patients."

Specific faculty members were 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, heading the office of PreHealth Advisement, has recently been joined by Dr. Chaya Rapp, to assist those students interested in careers in medicine, dentistry, and osteopathy. Mr. Jeff Mollin's focus is those students interested in careers in physical therapy, occupational therapy, physician assistant, and nursing

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.

In the 2013-2014 academic year, Dr. Loewy organized several seminars in which the guest speakers provided valuable insights into the various professions, as well as information on the admissions process to their

graduate and professional programs. SCW hosted its second annual Medical Schools Fair. Admission directors and officers from allopathic and osteopathic medical schools as well as American Medical Student Programs in Israel attended. Each had its own booth, thereby allowing students to approach the representatives and to ask questions and gain insight into each of the schools. The following schools were present at the fair: Hofstra, Sony Brook, Rutgers/UMDNJ, NYIT COM, Technion, Ben Gurion, Sackler, Rowan DO, TouroCOM, PCOM, and Quinnipiac.

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 the “Frontiers in Biomedical Science: Theory and Practice.” This project is under the direction of Dr. Edward Burns, Executive Dean of the Albert Einstein College of Medicine. The seminar meets six Fridays during the semester at AECOM and features leading biomedical scientists and their research. A second program, “Frontiers in Contemporary American Law," is under the direction of Vice Dean Melanie Leslie of Yeshiva University’s Benjamin N. Cardozo School of Law. This exciting enrichment program meets at Cardozo School of Law six Fridays during the Spring semester for two hour sessions and is led by Cardozo faculty. Scholars discuss the ways that the U.S. legal system resolves disputes and addresses fundamental questions of justice through legal reasoning and processes. The third program is Frontiers in Psychology. This enrichment program, organized in conjunction with Dean Lawrence Siegel of Yeshiva University’s Ferkauf Graduate School of Psychology, is an undergraduate program at the Ferkauf Campus. Scholars attend two-hour Friday seminars six times during the semester, led by Ferkauf faculty during the Fall semester on campus. The program aims to expose students to a spectrum of fields and specialties within psychology and to show students how the field’s practitioners evaluate and address current societal issues using the science of psychology.

Department of Biology

Faculty: Harvey Babich, Ph.D.; Bill Bassman, M.S.; Joseph DeSantis, Ph.D.; Marina Holz, Ph.D., Jessica Linderman, Ph.D.; Benjamin Lucas, Ph.D.; Brenda Loewy, Ph.D.; Amanda Mitchell, Ph.D., Jeffrey Mollin, M.Phil.; James Nussbaum, Ph.D.; Alyssa Schuck, Ph.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, , Ecology, Genetics, Human Anatomy, Human Biology, Human Development, Human Physiology, Immunology, Invertebrate Zoology, Kinesiology, Medical Biochemistry, Microbiology, Molecular Biology, Neurobiology, Nutrition, and Pharmacology.

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 course, Human Biology, was introduced in the Fall semester, 2010. This 4-credit course consists of both lecture and laboratory.

Exciting one credit Journal Club courses are offered. Dr. James Nussbaum, Ph.D., P.T., instructs the Journal Club course entitled, Human Gait, Fall semester, 2015. This Journal Club is geared to pre-PT and pre-OT students; in the Fall semester, 2014, Dr. Nussbaum taught the Journal Club course, Biomechanics. Journal Club courses offered in the Spring term are taught by SCW graduates in the Albert Einstein College of Medicine (AECOM) or in the Sue Golding Graduate Program in Biomedical Sciences, AECOM. The topic for the Spring term, 2016 Journal Club has not, as yet, been determined. In the prior Spring semester, 2015, the topic of this Journal Club was Immunology and Disease and was taught by Hadassa Klerman, Jennifer Deluty, and Elisa Karp.

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 Science Fellowship and guides students participating in this program. Dr. Schuck was selected as the Senior Class Professor of the Year, 2013, and again, for 2014.

In the 2014-2015 academic year the Biology Department hosted a series of *Torah U'Madda* presentations, including talks by Dr. Itsik Pe'er, Ph.D., Sequence of the Ashkenazi genome," and by Yael Kramer, M.S., Research in fertility interventions: forging a path from bench to baby." The YU Medical Ethics Society and the YU Center for the Jewish Future, cosponsored a symposium, that included presentations by Rabbi Dr. Edward Reichman and Dr. Nicole Agus, "Testing for cancer risk in the Jewish community: medical and *halachic* perspectives," and by Rabbi Dr. Zalman Levine and Rabbi Kenneth Brander, "Oocyte cryopreservation: freezing eggs, new technologies to help single women and cancer patients."

Dr. Margarita Vigodner and Dr. Marina Holz, both Associate Professors 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 and in 2013 received the LAM Foundation Pilot Award.

Dr. Vigodner's current support includes 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. Margarita Vigodner (third from left) and her researchers, Summer 2015

Dr. Holz's current funding includes: (a) American Cancer Society, RSG-13-287-01 TBE, "The role of mTOR signaling pathway in ER-positive breast cancer," 7/01/2013 - 6/30/17 [rated "Outstanding" 1st out of 74]; (b) NIH R15CA151112, "The role of mTOR signaling pathway in ER-positive breast cancer." 06/01/2010 – 06/30/2016; (c) Atol Charitable Trust, "The role of S6K1 in breast cancer," 6/01/2008 - 5/31/2019. The Atol Charitable Trust provided funding for the full renovation of the Holz laboratory. The American Cancer Society reached out to Dr. Holz, requesting her to become its Ambassador and to participate in a WABC Channel 7 special to air during Breast Cancer Awareness Week in October, 2015.

Dr. Holz's research team, Summer 2015

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 manuscripts with a publication date of 2013 and later.

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. (*in press*).

Alayev, A., Salamon, R.S., Sun, Y., Schwartz, N.S, Yu, J.J, and Holz, M.K.,2015, The combination of rapamycin and resveratrol causes apoptosis and reduces growth of TSC2-deficient xenograft tumors, Am. J. Respir. Cell Mol. Biol., Apr. 6 (Epub ahead of print).

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.

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., 77:95-97.

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.

Vigodner, M., Shrivastava, V., Gutstein, L.E., Schneider, J., Nieves, E., Goldstein, M., Feliciano, M., and Callaway, M., 2013, Localization and identification of sumoylated proteins in human sperm; excessive

sumoylation as a marker of defective spermatozoa, Human Reprod. 28: 210-223.

Alayev, A. and Holz, M.K. 2013, mTOR signaling for biological control and cancer. J. Cell. Physiol. 228:1658-1664.

Weisburg, J.H., Schuck, A.G., Reiss, S.E., Wolf, B.J., Fertel, S.R., Zuckerbraun, H.L. and Babich., H., 2013, Ellagic acid: A dietary polyphenol, selectively cytotoxic to HSC-2 oral carcinoma cells, Anticancer Res. 33:1829-1836.

Schuck, A.G., Weisburg, J.H., Esan, H., Robin, E.F., Bersson, A.R., Weitschner, T.R., Lahasky, T., Zuckerbraun, H.L., and Babich, H., 2013, Cytotoxic and proapoptotic activities of gallic acid to human oral cancer HSC-2 cells, Oxid. Antioxid. Med. Sci., 2:265-274.

Schuck, A.G., Weisburg, J.H., Greenbaum, R.E., Golfeiz, M.D., Segal, J.R., Weiss, R.A., Liebman, E.C., Zuckerbraun, H.L., Babich, H., 2013, Selective cytotoxicity of a grape seed proanthocyanidin extract to human oral carcinoma HSC-2 cells, Cell Develop. Biol. 2:121-128.

The Biology faculty presented their research at meetings of national and international societies. Below are some of these presentations listing, SCW undergraduates as coauthors.

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 (travel award for Anya Alayev)

Vigodner, M., 2014, Identification of novel genes affected by tobacco smoke in reproductive tissues, Developmental and Molecular Biology, Albert Einstein College of Medicine, New York, May
.
Vigodner. M., 2014, Studies of sumoylation in germ cells, Dr. Debra Wolgemuth Laboratory, Genetics and Development, Columbia University Medical Center, New York, July.

Holz, M.K., 2014, Targeting mTOR signaling in hormone-positive diseases. Department of Pathology, Tulane University, New Orleans, LA

Holz, M.K., 2014, Resveratrol in combination with rapamycin selectively induces apoptosis in TSC2-deficient cells - a new treatment strategy for LAM, LAM Symposium, Chicago, IL

Holz, M.K., 2014, Targeting mTOR signaling in breast cancer and lymphangioleiomyomatosis. Department of Pathology and Cell Biology, NYMC, Valhalla, NY

Xiao, Y., Pollack, D., Levy, A., Callaway, M., Edward Nieves, E., and Vigodner, M., 2014, Further confirmation of several important targets of sumoylation in testicular cells, American Society of Andrology, 39th Annual Conference, Atlanta, GA

Alayev, A., Snyder, R.B., and Holz, M.K., 2013, Targeting rapamycin-induced autophagy in cancer. AACR Frontiers in Basic Cancer Research, National Harbor, MD

Alayev, A., Snyder, R.B., and Holz, M.K., 2013, Targeting Akt reactivation following mTOR inhibition in breast cancer treatment. AACR Advances in Breast Cancer Research, San Diego, CA

Alayev, A., Snyder, R.B., and Holz, M.K., 2013, Apoptosis in TSC2-null cells. Molecular Targets and Cancer Therapeutics, Boston, MA

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.

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

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.

Undergraduates majoring in biology have achieved national recognition. Kayla Applebaum, a biology major, was named a 2014 Goldwater Scholar. She is also a Kressel Scholar for the 2013-2014 academic year. Naomi Schwartz, a May 2014 graduate and biology major, was named as one of 37 students to the Biochemistry Honors Society by the American Society for Biochemistry and Molecular Biology. The recipient of the Kressel Scholarship for the 2015-2016 academic tear is Sima (Jennifer) Grossman.

Off-campus research placements abound, with SCW students obtaining internships during the 2014-2015 academic year at The Rockefeller University, Mount Sinai School of Medicine, and Columbia University. Summers are a prime time for research. In the Summer, 2015, our students have participated in the YU-Bar Ilan University summer research program, as well as in interning in the Albert Einstein College of Medicine, Hackensack Univ. Medical Center, Rusk Institute for Rehabilitative Medicine; NYU Langone Medical Center, NYU Musculoskeletal Research Center, Blood Center of Wisconsin, CHOP Research Institute Summer Scholars Program (Philadelphia), Massachusetts General Hospital, Kessler Rehabilitation Institute (West Orange, NJ), CReATe Fertility Centre, an affiliate of Women's College Hospital and the University of Toronto, the Laboratory of Gastroenterology at the University of Chicago, Novartis Scientific Summer Scholars Program, and Winthrop Hospital.

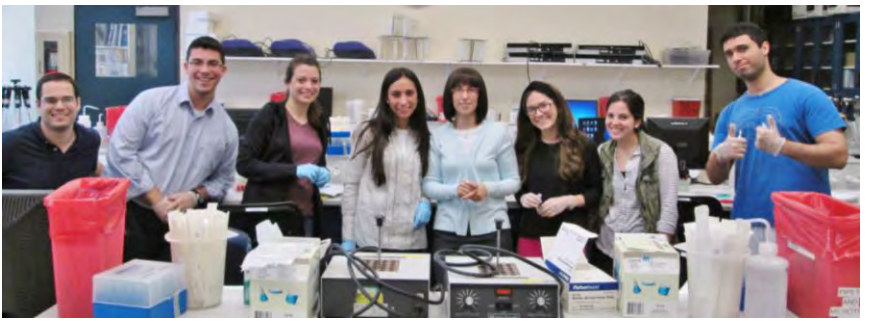
The Department of Biology has upgraded the infrastructure of the on-campus research laboratories. Beginning in the Summer, 2011, and extending into the Fall semester, the on-campus research laboratory (room 341 of 253 Lexington Avenue) of Dr. Holz was renovated and modernized through a $100,000 grant 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 increase her effectiveness in procuring external funding.

Aware of the need 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 for majors and non-majors, in Summer 2008 forty brightfield microscopes were purchased. In 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. 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.

In the 2014-2015 academic year, the Biology Club organized a series of career workshops for SCW Biology majors. One particularly 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.”



The courses Human Physiology and Microbiology were offered at SCW during the first summer 2015 session. Above is the Microbiology class, taught by Dr. Alyssa Schuck (fifth from the left).

Department of Chemistry and Biochemistry

Faculty: Allan Burger, Ph.D.; Lora Danley, M.S.; Cecily Dobin, M.S.; Donald Estes, Ph.D.; Jianfeng Jiang, Ph.D.; Daniel Lim, Ph.D.; Evan Mintzer, 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.

Research in computational chemistry, in the area of protein tertiary structure, is ongoing in the research group of Dr. Chaya Rapp. Dr. Rapp recently completed a three year grant from the National Institutes of Health (NIH) for her work on "Computational Modeling of Post-translational Modification in Proteins". Recent graduates Rachel Kirshenbaum, Elizabeth Goldberger and Talya Laufer were involved in this work and were co-authors on "Cation-π Interactions of Methylated Ammonium Ions: A Quantum Mechanical Study" (2014, Proteins 82:1494-1502) Currently our group is studying the effects of glycosylation on enzyme activity; Avital Shulman is comparing molecular dynamics simulations of glycosylated and unglycosylated structures of γ-Glutamyltranspeptidase in preparation of a manuscript entitled "The Role of Glycosylation in the Autocleavage of the GGT-I Enzyme." Rachel Goldreich is involved in a recently initiated collaboration between our group and the department of Biochemistry at AECOM in which we are studying the mechanism through which apoptosis is initiated by BIM-SHAB activation of the BAX protein.

The Mintzer group continues to make progress in the general areas of membrane-active antimicrobials and in the design of polymer-lipid formulations with a diverse array of biophysical applications. The former project, with the collaboration of Michael Palmer at the University of Waterloo, has yielded significant new data, the most recent of which were presented by several Stern researchers at two national conferences (American Chemical Society and Biophysical Society annual meetings, 2014) and reported in the Journal of Biological Chemistry (Zhang et al. (2014) 289:11584-11591). The results describe a possible mechanism of bacterial resistance to daptomycin. The latter project, which is being performed with Stern students and members of the Kathryn Uhrich group at Rutgers University, involves a) the design and mode of action of liposomal complexes used as siRNA delivery vehicles (Journal of Controlled Release; Gu et al. (2014) 184: 28-35); and b) the physico-chemical characterization of amphipathic polymer-lipid species that display selective antimicrobial properties (Langmuir (2015), under revision). Finally, a related and ongoing study is focused on the surface and aggregate properties of a novel amphiphile-lipid mixture and seeks to build upon the valuable information obtained earlier.

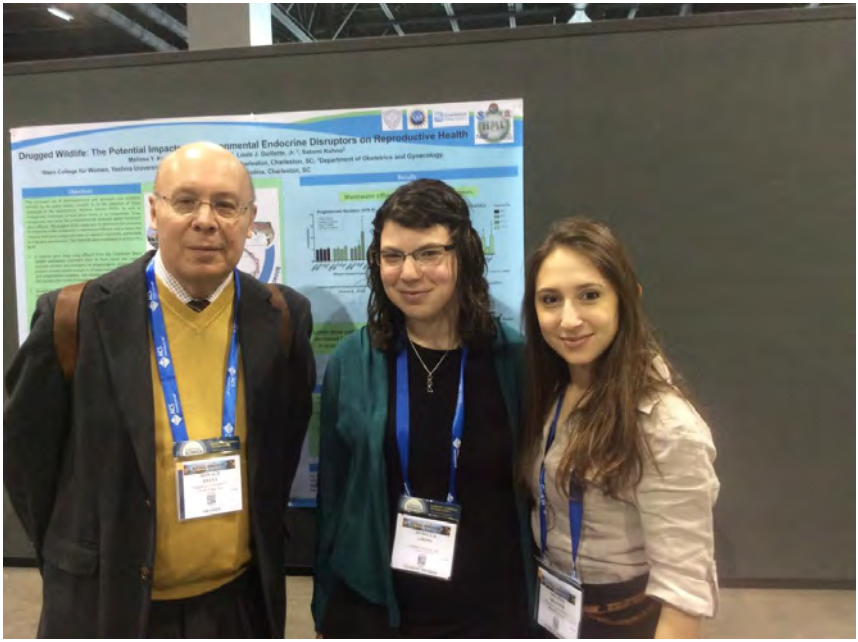
Dr. Jiang is interested in structures and functions of the active sites of metallo-enzymes by the synthesis and reactivity studies of the active sites' structural analogue complexes. Current student Miriam Stock is working on catalytic oxidation of carbonmonoxide by nickel and copper complexes at ambient condition.

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.

During fall of 2014, student Adi Cohen participated in synthetic methodology research that explored new ways to generate carbon-carbon bonds, via the Aldol reaction.

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 five 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 "Chemistry and Health", "Chemistry and Beauty", "Chemistry and Food", "Coloring the World in Chemistry", and "Chemistry and Outer Space". For the 2014-2015 academic year, the theme was "Chemistry and the Mind". Activities included attending a play at the CUNY Graduate Center, celebrating National Chemistry Week by hosting an ice cream making activity, celebration Earth Day with the environmental society by hiking through Central Park, and an outreach program at a New York City elementary school. Two students and one of the advisors attended the annual Nichols Symposium organized by the New York section of the American Chemical Society. To interest the entire student body, tie-dyeing and a magic show were also included in the Club's activities. The colorful magic show, directed by Mrs. Cecily Dobin and performed by members of the Club was one of the highlights of the year. Over the past decade, in recognition of its various accomplishments, the Club has been presented with Outstanding, Commendable, Honorable Mention, and Green Chemistry awards at ACS national meetings.

Leah Zerbib and Allison Belfer at the Nichols Symposium.



Dr. Don Estes with Melissa Kramer and Rebecca Gross, the student presenters at the undergraduate poster session of the 2015 ACS meeting in Denver, Colorado.

Chemistry Club members at an ice creaming making event celebrating “The Sweet Side of Chemistry” during National Chemistry week.

Chemistry Club members at the annual tie-dye event.

In recent years, the number of students enrolled in chemistry courses has increased significantly. The chemistry laboratories have been modernized and new instruments, including a nuclear magnetic resonance spectrometer, a fluorometer, an infrared spectrometer, a polarimeter, an automatic titrator, an isothermal titration calorimeter, a Langmuir trough, gas chromatographs, and a high speed centrifuge, were purchased over the past few years. 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. This year, the curriculum in the organic chemistry laboratory is being revised to reflect the changes in the MCAT format. The advanced course 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. The analytical chemistry course emphasizes modern instrumental methods whereas in the biochemistry course, experiments on lipid monolayers, lipid rafts, oligonucleotide melting, protein folding, and computational chemistry have been introduced. A course in medicinal chemistry, dealing with the discovery and design of new therapeutic agents and their development into useful medicines, was offered in the spring term. A chemistry course for non-science majors, examining chemistry as it relates to the world around us with emphasis on contemporary environmental issues, was also taught. In the summers of 2013-2015, General Chemistry course was offered at the Beren campus.

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., Professor; Emil Prodan, Ph.D., Professor; Lea Ferreira dos Santos, Ph.D., Professor; Mark Edelman, Ph.D., Clinical Associate Professor

The Physics Department at Stern College for Women (SCW) has been steadily gaining interest among incoming freshmen due to its "research and discovery approach" to education. Many talented students 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 our 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 extremely active research agenda, their articles being published in prestigious professional journals and their work has been highlighted in several occasions and awarded with 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.

In 2014, our Department has reached a significant milestone: Drs. Santos and Prodan, merely a year after being granted tenure at Yeshiva University, were both promoted to Full Professors, and Dr. Edelman – to Clinical Associate Professor. The decision by the University to grant them promotion is a recognition of their success in strengthening SCW physics, physical sciences and pre-engineering programs, advancing their research fields, and raising the academic standing of the University in the sciences.

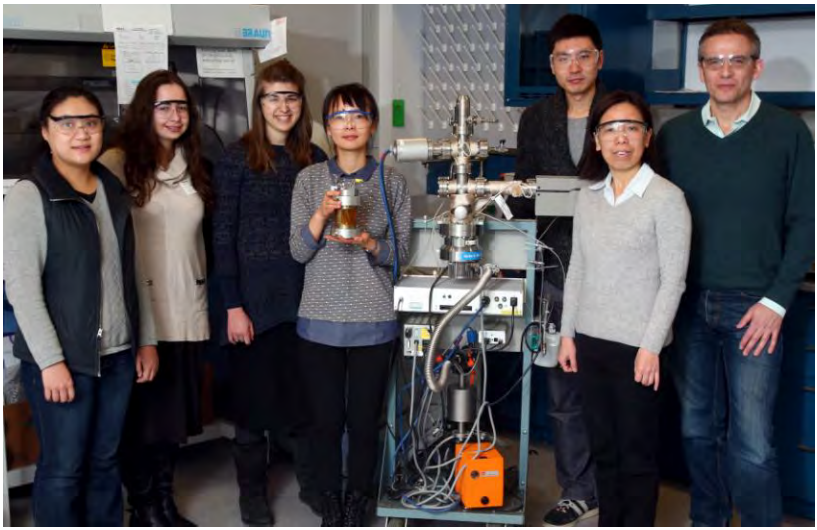
Stern College students who are interested in physics, physical sciences or engineering have an opportunity to actively participate in faculty research. The Physics Department is always seeking new students interested in doing first class research. They can choose from a variety of projects and work under 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. Many research activities involving SCW students take place at the Consortium facilities. His other Department of Energy and National Science Foundation grants support his research in properties of nanomaterials. He supports three postdoctoral research associates and hosts visiting resident scientists per year.

Physics students benefit from an intense and challenging curriculum. In the spring of 2015, the physics courses offered included General Physics (calculus based), Introductory Physics (algebra based), Classical Mechanics - II, 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.;Robin Freyberg, 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 MS 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. Freyberg exploring the role of olfaction in social and emotional behavior, and 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 where he has been ever since. He teaches basic courses in Experimental Psychology, Cognition, Learning, Psychobiology, as well as advanced courses such as Mind, Language, and Consciousness. 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. 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 where she investigated anticipatory distress in women receiving chemotherapy for breast cancer. She 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. Dr. DiLorenzo's research focuses on health-related attitudes and cognitions and their relations to health behaviors, as well as quality of life in women receiving radiation treatment for breast cancer. Dr. DiLorenzo has involved a number of Stern College students in her research projects and has supervised several others completing independent projects. Dr. DiLorenzo teaches the Honor's Psychology Research Seminar in which upper-level psychology majors complete psychology research internships and has recently developed and co-taught Fundamentals of Public Health, a graduate-level course open to both Stern College for Women and Yeshiva College students.

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. Robin Freyberg received a B.A. in Psychology from Columbia University and a Ph.D. in Social Developmental Psychology from Rutgers University – New Brunswick. She joined the Psychology Department of Stern College for Women in 2005. She also is an Adjunct Assistant Professor of Psychology in Psychiatry at Weill Cornell Medical College. Since opening her Social Development Laboratory at Stern, she has supervised over 40 students in a variety of lab projects and independent research. Dr. Freyberg's research explores how the olfactory environment influences social and emotional behavior as well as the role of narrative in psychiatric diagnosis and treatment. Aside from research, Dr. Freyberg teaches a wide variety of courses at Stern including Introductory Psychology, Developmental Psychology, Social Psychology, Cross-Cultural Social Development, Personality, Psychology of Women, and the Emotion Seminar. She also serves as the pre-psychology advisor where she advises

students at all stages of the psychology major to help them prepare for careers in psychology.

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. 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.

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 the BA degree after successfully completing one semester at NYUCN. They are awarded the BSN 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 the 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 N.J. During the 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. at the completion of the 3-year program.

In addition, though an Articulation Agreement with 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, qualified students 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
Deena Blanchard
Rachel Blinick
Yael Boyarsky
Zahava (Nilly) Brodt
Faigy Burekhovich
Aliza Charlop
Tzipa Chaim
Esti Charlop
Elana Clark
Barrie Cohen
Davida Cohen
Michelle Cohen
Sarit Cohen
Jennifer Deluty
Ellen Dinerman
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
Rachel Kirshenbaum
Hadassah Klerman
Lea Kozirovsky
Aimee Krausz
Malka Krupka
Yosefa Lerner
Rikah Lerer
Elisheva Levine
Emily Liebling
Elizabeth Lobell
Shira Marder
Esther Mizrachi
Sara Mizrachi
Ariella Nadler
Sarah Nattel
Helen Nissim
Sarah 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

Students' Accomplishments
Academic Year 2014-2015 and Summer 2015:
Depts. of Biology, Chemistry/Biochemistry, Physics, Psychology

Grad/Professional Program	Institutions; # of attendees
Allopathic medical school	Albert Einstein College of Medicine (11 students); additional 12 graduates in various American medical schools (including Rutgers; New York Medical College; Quinnipiac Univ.; NYU) and American medical schools in Israel and the Caribbean
Osteopathic medical school	NY College of Osteopathic Medicine (3 students)
Dental school	Penn; NYU; Stony Brook; UMDNJ; Rutgers; Boston Univ; Temple Univ (10 students)
Podiatry	NY College of Podiatric Medicine (1 student)
Clinical psychology (Ph.D./Psy.D)	Ferkauf; Hostra Univ. (2 students)
Physical therapy (doctorate)	Hunter: Drexel Univ.; Touro; LIU (8 students)
Pharmacy (PharmD)	Rutgers (1 student)
Biomedical engineering (M.S.)	Boston (half tuition schol.) (1 student)
Chemical engineering (M.S.)	Columbia University (1 student)
Mechanical engineering (M.E.)	Columbia University (1 student)
Physician assistant	Drexel Univ.; Midwestern Univ.; Downstate, Towson; Mercy College (1 student, joint program) (9 students)
Occupational therapy	Columbia Univ., NYU, LIU (3 students)
Bioethics (M.S.)	AECOM (1 student)
Nursing	NYU (joint program, 7 students); Pace Univ.; Columbia Univ.; Univ. Maryland; Univ. Miami; Hunter-Bellevue; Rush Univ. (22 students)
School psychology (M.S.)	Queens College (1 student)
Nutrition (M.S.)	Brooklyn College; NYU (2 students)
Social work (M.S.)	Fordham Univ.; Columbia Univ.; Hunter College; NYU (6 students)
Prosthetics (M.S.)	Univ. of Chicago (1 student)

Awards

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

Jennifer (Sima) Grossman: designated a Kressel Scholar, academic year, 2015-2016 (Dr. M. Holz)

SCW graduates, currently medical students at AECOM, have established the undergraduate research internship, the Stern-Einstein Research Connection (SERC) Scholar. The SERC Scholar performs summer research at AECOM. Miriam Pearl Klahr was the SERC Scholar for summer, 2015.

Summer 2015 internships

Chaya (Anna) Apfel: Hackensack Univ. Medical Center (medical internship program)

Abigail Bergman: SURP, AECOM

Nicole Berk: Rusk Institute for Rehabilitative Medicine (OT program), NYU

Elizabeth Bitterman: Bar Ilan University (YU-BIU program)

Chana Bushee: Blood Center of Wisconsin

Reeva Black: North Shore/LIJ's Cohen Children's Hospital

Aviva Cantor: Bar Ilan University (YU-BIU program)

Emily Chase: Bar Ilan University (YU-BIU program)

Adi Cohen Berman: Department of Biology, SCW (Dr. Marina Holz)

Rena Davidson: The Rockefeller University

Elisheva Elbaz: Bar Ilan University (YU-BIU program)

Justine Englanoff: Children's Hospital, Los Angeles

Tehila Feinberg: research with IVF physician on fertility and triplo-X women

Tamar Fishweicher: Rusk Institute for Rehabilitative Medicine (PA program), NYU

Hanah Geller: Massachusetts General Hospital (pediatric psychiatric clinic)

Elana Gelman: NYU Langone

Merav Gold: Bar Ilan University (YU-BIU program)

Tamar Golubtchik: NYU Langone

Jennifer (Sima) Grossman: CHOP Research Institute Summer Scholars Program (CRISSP), Philadelphia

Elisheva Jacobov: Bar Ilan University (YU-BIU program)

Yael Hausdorff: JAG Physical Therapy and PT Dept, Kessler Rehabilitation Institute (West Orange, NJ)

Hadassa Hirschfield: Montefiore Hospital

Michelle Katz: Bar Ilan University (YU-BIU program)

Miriam Pearl Klahr: SERC Scholar, AECOM

Kayla Krok: OT/PT Depts., Kessler Institute of Rehabilitation (West Orange, NJ)

Ariella Levie: Bar Ilan University (YU-BIU program)

Nechama Lipton: CReATe Fertility Centre, an affiliate of Women's College Hospital and the University of Toronto

Sara Lis: Department of Biology, SCW (Dr. Marina Holz)

Rebecca London: Bar Ilan University (YU-BIU program)

Yael Jessica Mayer: Bar Ilan University (YU-BIU program)

Talya Menashe: NYU Dental Clinic

Dafna Meyers: Laboratory of Gastroenterology (Dr Eugene Chang), University of Chicago

Shoshana Mond: SURP, NYU Musculoskeletal Research Center

Melanie Moore: Rusk Institute for Rehabilitative Medicine (OT program), NYU

Devorah Natelson: Bar Ilan University (YU-BIU program)

Ayala Ouanounou: Novartis Scientific Summer Scholars Program

Dena Phillips: Department of Biology, SCW (Dr. Vigodner)

Chana Ratner: Mt. Sinai School of Medicine (Dr. Schahram Akbarian)

Irene Razi: David Geffen School of Medicine, UCLA (Dr. Chen Pang)

Adira Reback: clinical research, University of Washington

Batsheva Reich: Bar Ilan University (YU-BIU program)

Sara Rozner: Bar Ilan University (YU-BIU program)

Amalia Schwartz: Bar Ilan University (YU-BIU program)

Miriam Segal: Onward Israel Program

Yael Steinberg: Bar Ilan University (YU-BIU program)

Nahal Talasazan: Neurology Department, Winthrop Hospital (Dr. Stecker)

Kelley Tripp: Rusk Institute for Rehabilitative Medicine (PA program), NYU

Rebecca van Bemmelen: Bar Ilan University (YU-BIU program)

Rachel Weil: clinical research with a pediatric ENT (clinical)

Sara Leora Wiener: Hackensack University Summer Internship, Mount Sinai Patient Care; Department of Biology, SCW (Dr. Marina Holz)

Aviva Zaghi: Rusk Institute for Rehabilitative Medicine (PA program) , NYU

Students' Publications and Presentations

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

Alper, J. and Prodan, E., 2015, Topological phonon modes in quasi-one-dimensional mechanical systems (*in preparation*).

Torres-Herrera, E.J., **Kollmar**, **D**., and Santos,L.F., 2015, Relaxation and thermalization of isolated many-body quantum systems, arXiv:1403/6481, Physica Scripta (*accepted*).

Alayev, A., Salamon, R.S., Sun, Y., **Schwartz, N.S**, Yu, J.J, and Holz, M.K., 2015, The combination of rapamycin and resveratrol causes apoptosis and reduces growth of TSC2-deficient xenograft tumors, Am. J. Respir. Cell Mol. Biol., Apr 6 {Epub ahead of print].

Korobko, R., **Lerner**, **A**., Li, Y., Wachtel, E., Frenkel, A.I., and Lubomirsky, I., 2015, *In-situ* extended X-ray absorption fine structure study of electrostriction in Gd doped ceria, App. Phys. Lett.106: 042904

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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.

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Rapp, C., **Goldberger, E., Tishbi**, N., and **Kirshenbaum, R.,** 2014, Cationπ interactions of methylated ammonium ions: A quantum mechanical study, Proteins: Structure, Function, and Bioinformatics 82:1494-1502.

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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.

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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-15 International 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.

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

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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.

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Freyberg, R., and **Bart, M**., 2012, Olfactory environment influences close relationships through multiple methods of measurement. Poster presented at

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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.

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

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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

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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.

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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.

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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.

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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

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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).

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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)

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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.

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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

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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.

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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).

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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.

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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

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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, NY, 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

Derech HaTeva is an undergraduate publication of Stern College for Women. The manuscripts are a synthesis of Torah and science and represent the unique intellectual strengths and talents of our students. This journal is catalogued in the National Library of Congress.

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Women in Science: Abstract Booklet

Yeshiva University
Stern College for Women

Volume XI, 2014-2015

Co-Editors: Elizabeth Bitterman, Emily Chase,
Emma Cohen, and Michelle Katz

Synthesis of an Ideal Silane Surface for DNA Adsorption and Desorption

By: Alyssa Auerbach[1], Sean Donnelly[2], Julia Budassi[3] and Dr. Jonathan Sokolov[3]

[1]Stern College for Women, [2]South Side High School, [3] Stony Brook University

The overarching goal of this project is to develop a way to cut DNA into segments of known lengths so that DNA sequencing by Next Generation sequencing technologies can be streamlined. DNA sequencing has significant applications in many fields, including personalized medicine and forensics, and improving the process has far-reaching implications. Currently, most methods of DNA sequencing involve cutting the DNA sample randomly by sonication, amplifying the DNA fragments, and using overlaps in the fragments' sequences to determine where the pieces go in the overall sequence[1], which is particularly time consuming. Cutting the DNA while preserving the order of cut pieces would resolve the major issues that repeating sequences in the samples cause, as the origins of the individual pieces could be easily identified. This lab has attempted to do this by combing the DNA onto a surface, cutting it using soft lithography, removing it from the surface, and amplifying the ordered fragments. The work presented here aimed to develop a silane surface onto which DNA can be combed and from which the fragments can be removed easily.

Multiple factors were varied in order to develop an optimal silane surface for adsorption. Silicon wafers were silanized with (3-aminopropyl)triethoxysilane (APTES) in small Teflon® tubs at ambient temperature for varying lengths of time. Phosphate buffered saline (PBS) and toluene were used as solvents with varying concentrations of APTES. Results indicated 0.5% APTES dissolved in PBS silanized for 70 minutes produced the smoothest surfaces. After finding an optimal silanization method, we incubated the surfaces with glutaraldehyde and bovine serum albumin (BSA) in a humidity chamber.[2] DNA was combed onto the surface by withdrawing the surfaces from DNA solution at a constant speed. Both the dye used to observe DNA as well as the concentration of DNA in lanthanum (III) chloride solution were varied.

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Fluorescence microscopy results, depicted below in Figure 1, show that DNA can be combed onto a silicon surface silanized for 70 minutes with 0.5% APTES in PBS and incubated with glutaraldehyde and BSA. However, the DNA depicted in the figure (the dimmer bright spots) is not as linear nor as dense as was expected, although it was shown that higher concentrations of DNA in solution led to higher density on the surface. No significant differences were observed between the two dyes used, YOYO-1 and SYBR® Gold.

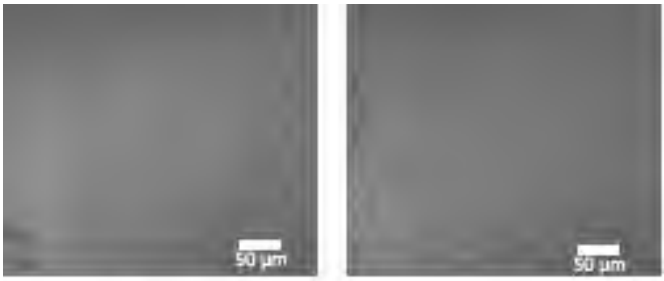

Figure 1: Images of combed DNA on a silanized surface taken using a confocal microscope

Future work will include varying the concentration of lanthanum (III) chloride solution used to dissolve the DNA to obtain linearized DNA on the surfaces, and attempting to desorb the DNA from the surface using poly(acrylic acid) (PAA). We speculate the 4mM lanthanum (III) chloride solution used may be too concentrated, leading to shearing of the DNA. Using a less concentrated lanthanum chloride solution, and preparing fresh DNA solutions may resolve this problem. Once the DNA has been linearized on the surface, we will attempt to remove the DNA to determine its viability for usage in cutting DNA using soft lithography.

Elucidating the Mechanism of Dazap2 Mediated Germ Plasm Maintenance

By: Abigail Bergman[1,2], Meredyth M. Forbes[2] and Florence L. Marlow[2,3]

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Primordial Germ Cells (PGCs) are the stem cells of the germline. Germline specification can occur through induction by zygotic factors, or through the inheritance of maternal factors called Germ Plasm (GP). GP first localizes to the Balbiani body (Bb) of primary oocytes and is later inherited in the cells that will become the PGCs. When PGCs are formed, the GP components localize in granular structures, or germ granules. While the mechanisms contributing to germ granule development are still poorly understood, our lab has recently identified the scaffold protein Dazap2 as a regulator of germ granule maintenance in embryonic PGCs. Dazap2 mutant ovaries lack overt defects in GP localization and oocyte polarity indicating that there are distinct mechanisms for GP maintenance in the oocyte and the embryo. In order to understand the mechanism by which Dazap2 contributes to germ granule maintenance, we are using biochemical methods to identify and analyze proteins that bind to Dazap2 in oocytes and PGCs. This study will provide further insight into how Dazap2 regulates germ granule maintenance.

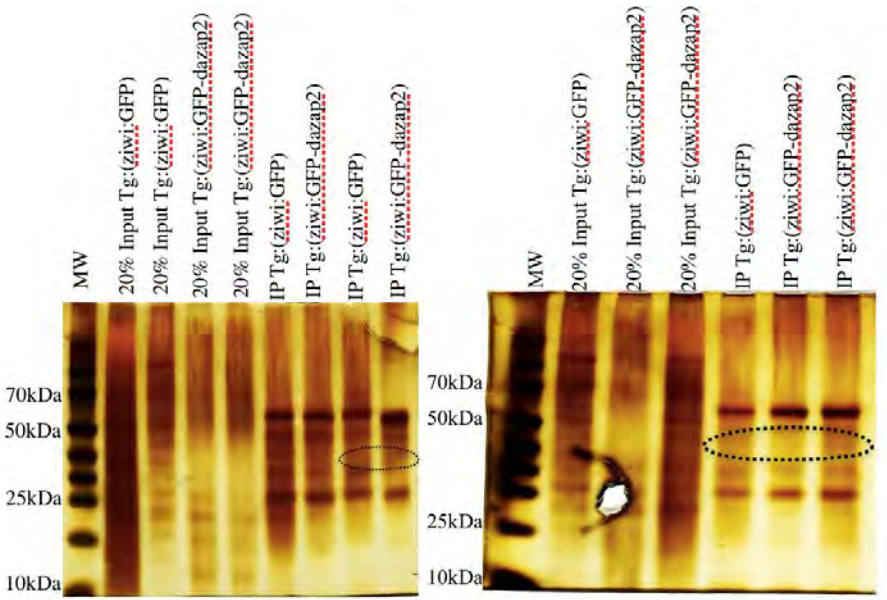

Figure 1: Immunoprecipitation Assays detect proteins that bind Dazap2. Circled areas highlight proteins bands present in dazap2 transgenic embryos that are not present in the control transgenic embryos

Raptor Mediated mTORC1 Phosphorylation of ERα in Breast Cancer

By: Adi Y Berman[1], Anya Alayev[1], Rachel S Salamon[1], Sara Malka Berger[1], Naomi S Schwartz[1], Rafael Cuesta[1], Rose B Snyder[1] and Marina K Holz[1,2]

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Breast cancer is the leading cause of cancer-related deaths among women, and 1 in 8 women is diagnosed with breast cancer annually. Approximately 75% of breast cancers are estrogen receptor alpha (ERα) positive. The most common course of treatment for such cancers is endocrine therapy, such as tamoxifen or aromatase inhibitors. However, patients treated with endocrine therapy often develop resistance, either de novo or acquired, which is perpetuated by the hyperactivation of growth factor signaling pathways. One such pathway, the mechanistic target of rapamycin complex 1 (mTORC1) has emerged as a critical node in estrogenic signaling. Our previous studies have shown that mTORC1 phosphorylates and activates ERα on S167 via its effector the 40S ribosomal S6 kinase 1 (S6K1). Our current research reveals a more direct link between mTORC1 and ERα. We found that ERα directly interacts with regulatory-associated protein of mTOR (Raptor). Upon estrogen stimulation, Raptor and ERα cotranslocate to the nucleus, as seen by co-immunoprecipitation analysis, immunofluorescence and cellular fractionation experiments. These findings indicate the importance of understanding the role of this ERα-Raptor interaction and the mechanism of estrogen mediated localization of raptor to the nucleus. This direct link between mTORC1 and ERα further implicates mTORC1 signaling in the pathogenesis of ERα-positive breast cancer and supports FDA-approved use of mTORC1 inhibitors in combination with endocrine agents for treatment of this disease and prevention of endocrine therapy resistance.

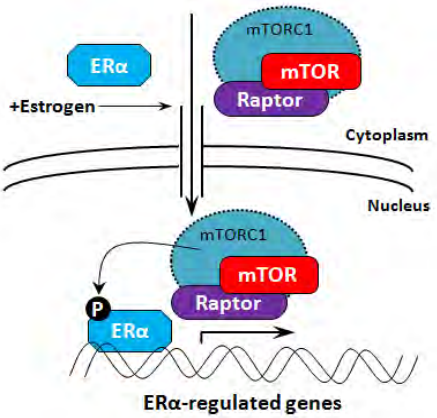

Figure 1. Schematic Representation of ERα-Raptor interaction

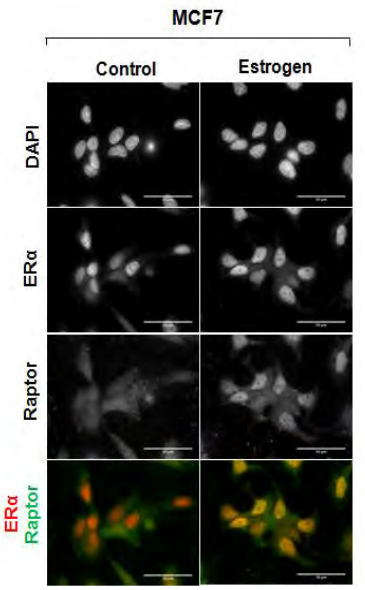

Figure 2. Raptor and ERα nuclear colocalization. Using immunofluorescence, we found that Raptor and ERα colocalize in the nucleus upon estrogen stimulation

Influence of Exercise-Related Energy Metabolites on Neurogenesis

By: Elizabeth Bitterman, Dr. Eitan Okun[2] and Aviva Rotter-Maskowitz[2]

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Adult neurogenesis is the process through which stem cells and progenitor cells proliferate, differentiate, migrate and integrate into an existing neural network. Until the 1990's it was generally accepted that neurogenesis only occurred during pre-natal development and ceased once born. While this is true for the bulk of neural pathways, research in the past 15 years has shown that adult mammalian neurogenesis occurs primarily in two regions of the brain: the subventricular zone and the hippocampus. This exciting discovery has spurred researchers to explore a range of topics including the molecular basis of neurogenesis, the neuronal involvement in learning and memory, neurodegenerative disorders (such as Alzheimer's Disease and Parkinson's Disease), and the recovery from trauma and stroke.

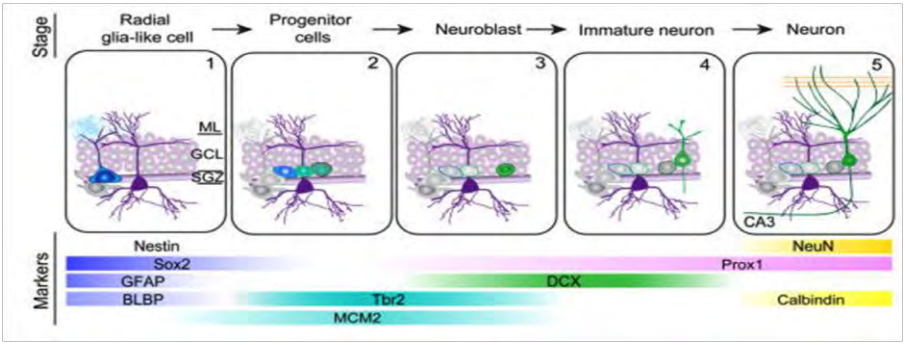

Figure 1. Schematic of neurogenesis processes in adult hippocampus with markers used for immunostaining at each respective stage.

The subgranular zone of the dentate gyrus, a portion of the hippocampus, is exceptionally notable for contributing to adult neurogenesis. Each day, it produces thousands of cells which initiate the neurogenesis process. Very few of those cells actually reach the mature neuron state, with this final number varying depending on factors such as sleep, stress, age and exercise. Among others, these factors determine how conducive the microenvironment is for neurogenesis at any given time.

Aerobic exercise in particular has been shown to have a positive effect on hippocampal neurogenesis. This can be explained by the production of various metabolites that are byproducts of aerobic (and anaerobic) glucose

metabolism. The proliferation of neural stem cells and neural progenitor cells are heavily affected by the availability of energetic sources in the brain.

The aim of this experiment is to examine the relationship between an increase in exercise-related energy sources and neurogenesis. To achieve this, *in-vivo* research was conducted, in which the test group of mice was treated with energetic metabolites. After which, a process of immunostaining, image acquisition, and stereological analysis was conducted to quantify neurogenesis. While the lab is presently in the process of stereological analyzation, early results look promising.

Comparing Adult and Neonatal Platelet Activation Using Flow Cytometry

By: Chana Bushee[1] and Dr. Rachel Bercovitz[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Medical Sciences Institute, Blood Center of Wisconsin, Milwaukee, WI

Background: Current platelet function tests such as aggregometry cannot be practically used in neonates because of the large volume of blood (10-20 mL) required to perform the assay. New, small volume assays of platelet function are needed in this population. Flow cytometry requires minimal blood volume (~200 μL) and can be used to evaluate the changes platelets undergo when activated. These changes include a conformational change in glycoprotein (GP) IIbIIIa into its active form and degranulation of alpha granules. P-selectin translocates to the platelet surface upon degranulation.

Aim: To use flow cytometry to determine if there is a difference in expression of activated GPIIbIIIa and surface P-selectin in neonates compared to adults in both unstimulated and agonist-stimulated platelets.

Materials and Methods: Blood samples were drawn into sodium citrate from 10 healthy adult volunteers and 6 neonates; cord blood was used as a proxy for neonatal blood. This blood incubated with a platelet-specific antibody (312.2, which binds active and inactive GPIIbIIIa) bound to a fluorophore, AF660. PAC-1-fluorescein isothiocyanate (FITC) and α-P-selectin-phycoerythrin were added to label activated GPIIbIIIa and P-selectin, respectively. One sample was unstimulated. Agonists used to stimulate platelets were adenosine diphosphate (ADP) at high and low doses (5 and 0.6 μM) and thrombin receptor-activating peptide (TRAP, 7 μM). Samples were incubated for 20 minutes in the dark at room temperature. GPIIbIIIa and P-selectin expression were measured as the median fluorescence intensity (MFI). Flow cytometry was performed on the Accuri C6 and data were analyzed using FlowJo. Student's t test was used to compare expression of GPIIbIIIa and P-selectin**.**

Results: There was no difference in GPIIbIIIa expression (both active and inactive conformations) or P-selectin exposure in unstimulated cord blood and adult samples. In general, upon activation, expression of GPIIbIIIa and P-selectin were lower in cord blood platelets compared to adult platelets.

The biggest difference was seen in response to TRAP; activated Gpllbllla and P-selectin expression were significantly lower in cord blood compared to adult blood (3,537.7 ± 1,558.7 vs. 7,995.7 ± 1,537.6, respectively, p=<0.0001, and 5,416.3 ± 2,677.6 vs 9,333.6 ± 1,975.8, respectively, p=0.0046). Figures 1-3 show the levels of GPIIbIIIa (1), activated GPIIbIIIa (2), and P-selectin (3) in cord blood and adult platelets.

Conclusions: At baseline, cord blood platelets have the same GPIIbIIIa expression as adult platelets. Cord blood platelets also have the same amount of activated GPIIbIIIa and P-selectin exposure at baseline. However, cord blood platelets have a lower GPIIbIIIa expression and activation, and a lower P-selectin exposure to ADP and TRAP than adult platelets. The data collected also serve as a foundation for future research to be performed using flow cytometry with the intent of using it for clinical testing.

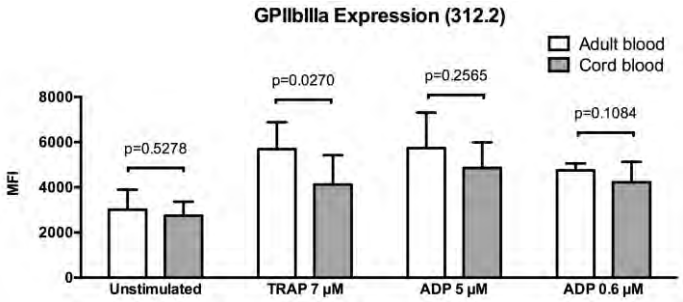

Figure 1: GPIIbIIIa expression on unstimulated and agonist-stimulated adult and cord blood platelets.

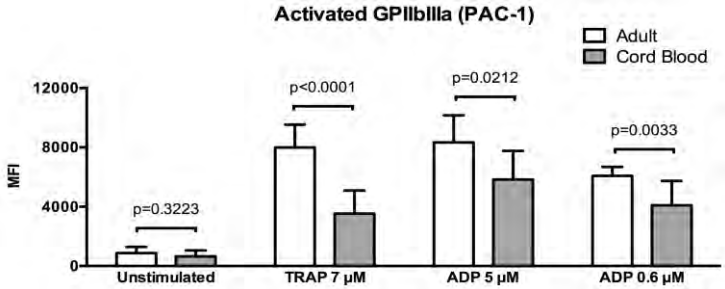

Figure 2: Activated GPIIbIIIa expression on unstimulated and agonist-stimulated adult and cord blood platelets.

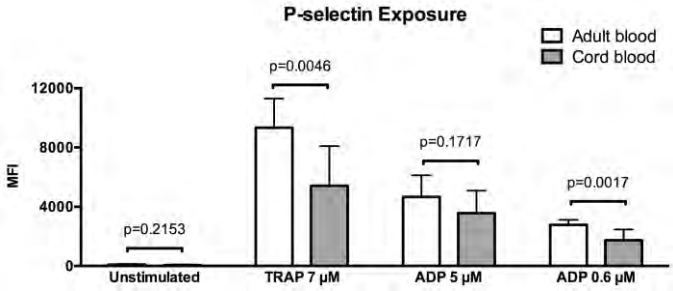

Figure 3: P-selectin exposure on unstimulated and agonist-stimulated adult and cord blood platelets.

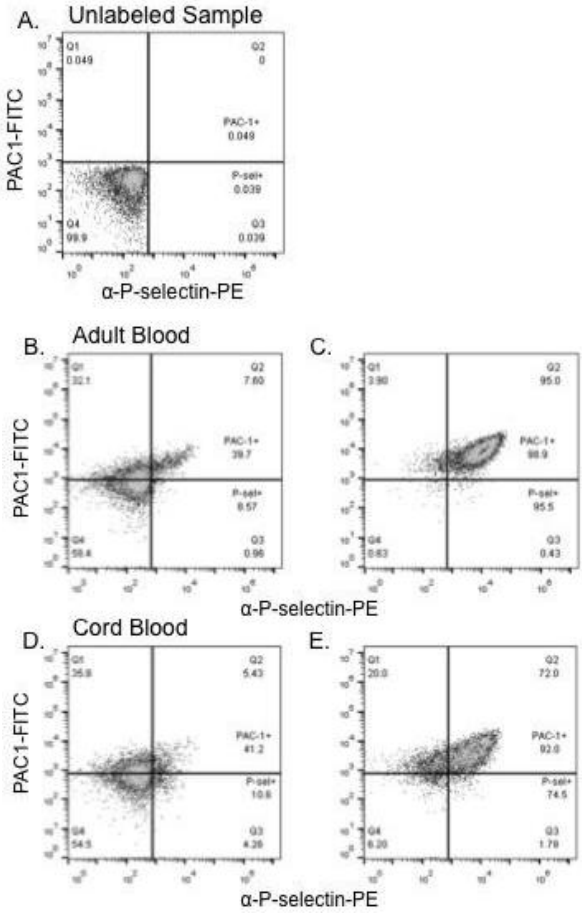

Figure 4: Representative Flow Cytometry Data. Platelets were identified by size and shape using forward and side scatter. In samples B-E, only platelets positive for 312.2 were included. All samples except A-C came from the same adult subject and D and E came from the same cord blood. (A) Unlabeled. (B) Unstimulated C) Stimulated with TRAP (7μM). (D) Unstimulated (E) Stimulated with TRAP (7μM).

Effect of Combat Exposure on Emotional Facial Expression Recognition and Processing

By: Aviva Cantor[1], David Anaki[2] and Adi Reuveni[3]

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Exposure to dangerous and deadly situations has been shown to affect veterans in a number of ways. Many develop psychiatric disorders, most commonly Post Traumatic Stress Disorder (PTSD), while others show changes in cognitive and social functioning. The recognition and processing of emotional facial expressions is an important aspect of social functioning that has been examined among military veterans. Theories on emotional facial recognition state that the ability is of evolutionary importance, since the detection of danger allows one to appropriately respond to and/or avoid threats, which provides a survival advantage. Previous studies have shown that threatening facial expressions, such as anger and fear, are detected more accurately and rapidly, and with minimal attentional investment, as compared to neutral and happy facial expressions.

Other facial expression processing studies demonstrate a "negativity bias," in which negatively valenced emotional facial expressions elicit a greater physiological response than positive or neutral emotional facial expressions.

Our study examined how exposure to threatening situations affects emotional facial recognition in combat veterans on a behavioral level, as well as the differences in emotional facial processing of combat and noncombat veterans on an electrophysiological level. Forty-two combat and noncombat veterans of the IDF participated in the study. Questionnaires that measured the presence of PTSD and anxiety disorders were administered before testing, and no significant differences were found between the combat and noncombat groups. Participants of both the combat and noncombat veterans groups were presented with a series of emotional faces (anger, happy, sad, fear, disgust and neutral) and were asked to identify the emotion. It was hypothesized that the combat veterans would show greater recognition of the negative emotions as compared to the non-combat group. Differences in the emotional facial processing of the two groups were expected to be manifested in event-related potential (ERP) waveforms.

Accuracy of facial expression recognition was measured as the behavioral component of this study. Our results indicated a significant main effect for emotion. Although both combat and noncombat soldiers identify emotional faces with similar accuracy, they do show a difference in their recognition of fear and disgust expressions, and the emotions themselves vary in terms of the accuracy with which they are recognized (Figure 1). Our findings suggest

that there are indeed some differences in the emotional facial expression processing of combat and noncombat veterans.

The electrophysiological response to the emotional facial expressions was measured using ERPs, the measured brain response that results from the presentation of a specific visual or auditory stimulus. ERPs are measured using electroencephalography (EEG), and serve as a noninvasive means of examining cognitive functioning. The components of the ERP waveform we primarily focused on were the posterior P1 and N170, the frontal N1 and P2, and the LPP. The amplitude and latency of the aforementioned wave components were analyzed using BrainVision Analyzer 2.0. A three-way interaction effect was found for group, hemisphere and emotion. An asymmetry was found in the right and left hemispheres for N170 amplitude corresponding to the processing of emotional facial expressions (Figure 2). Combat veterans showed higher responses in the left hemisphere (P7 and P9 electrodes), while noncombat veterans showed greater responses in the right hemisphere (P8 and P10 electrodes).

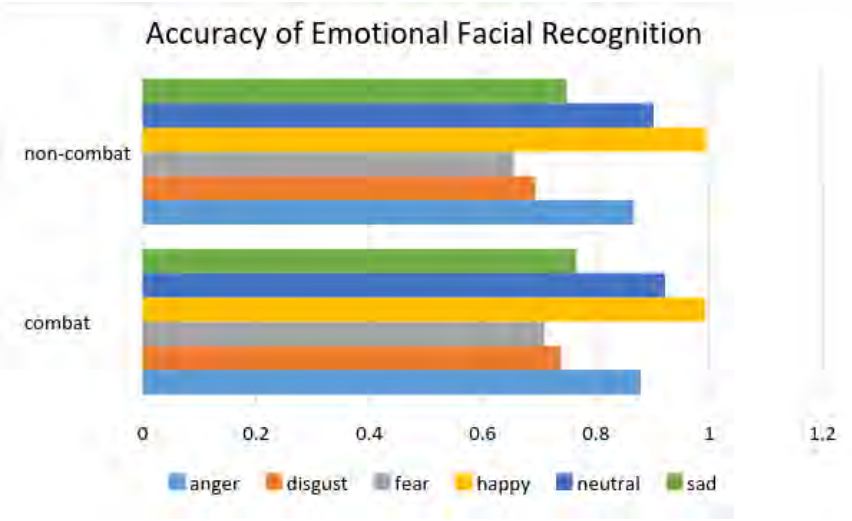

Figure 1. Accuracy of Emotional Facial Recognition in combat and non-combat veterans for 6 emotional facial expressions.

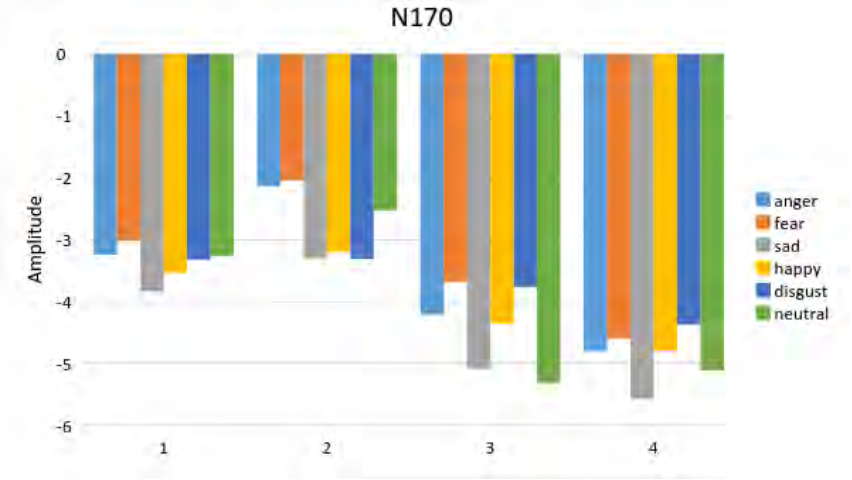

Figure 2. N170 amplitude in right and left hemispheres for the recognition of 6 emotional facial expressions by combat and non-combat veterans.

Difference in Gene Expression in Parental and Transformed Epithelial Cells

By: Emily Chase[1], Michal Schwartz[2] and Ofir Hakim[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Life Sciences, Bar Ilan University, Ramat Gan, Israel

Altered gene expression is one of the major causes of carcinogenesis. Expression is commonly controlled by the binding of transcription factors to regulatory sites, which are likely to be found a few hundred kilobases around the gene. The goal of this study was to find transcription factors relevant to the altered gene expression by comparing changes in gene expression with changes in the activity of regulatory regions found in close proximity to the genes of interest. To accomplish this, we first had to quantitate the changes in gene expression. We performed RNA-seq on mammary epithelial cells transformed with a HRAS oncogene and on the parental cells in order to measure the difference in RNA levels. To validate the RNA-seq results, we picked a number of differentially expressed genes and tested them in real-time PCR. Using exon-exon primers to measure total mature RNA, we found that the fold change calculated from the RNA-seq correlated with the data from real-time PCR. The results from both data sets indicate that the genes CDH1, FN1, and LAMC2 are repressed and the genes IL6, PPARG, FGF2, and EGLN3 are activated in HRAS-transformed mammary epithelial cells when compared with normal mammary epithelial cells. Samples were run in electrophoresis gel following real-time PCR and the results confirmed the identities of the amplified DNA sequences as the intended genes. Biological repeats were performed and results were consistent with previous data. Using intron-exon primers with real-time PCR to measure nascent RNA, we found that nascent RNA levels correlate with changes in mature RNA levels determined in RNA-seq. This shows that most of the differences we see in total mature RNA levels between HRAS-transformed and normal mammary epithelial cells are due to transcriptional changes. The validation of the alteration in gene expression after transformation will be used to compare to changes in the activity of regulatory sites in order to identify regulatory sites that are associated with differentially expressed genes. From this data, we aim to determine transcription factors relevant to the changes in gene expression during cancerous transformation.

Age and Alzheimer's Disease Gene Expression Profiles Reversed by Glutamate Modulator Riluzole

By: Davidson RL[1,2], Pereira AC[2], Gray JD[2], Kogan JF[2], Rubin T[2], Morrison JH[3] and McEwen BS[2]

[1]Stern College for Women, [2]Laboratory of Neuroendocrinology, The Rockefeller University, [3]Fishberg Department of Neuroscience and Kastor Neurobiology of Aging Laboratories, Icahn School of Medicine at Mount Sinai

The hippocampus is a brain structure is essential for learning and memory. It is mostly composed of glutamatergic pyramidal neurons. Glutamate is the primary excitatory neurotransmitter in the brain, and is critical for hippocampal-dependent learning and memory processes. Extracellular glutamate concentration is highly regulated by excitatory amino acid transporters, EAATs. EAAT2, located on glial cells, is the major transporter in the brain and clears glutamate from the synapse and increases glutamate recycling through the glutamate-glutamine cycle.

Cognitive decline associated with aging is correlated, not with neuronal death, but with the deterioration neural circuits, involving alterations of glutamatergic synapses in pyramidal neurons. The neural circuits vulnerable to age-related synaptic alterations are also affected by Alzheimer's disease [AD]. Synaptic dysfunction and loss is highly correlated to the loss of memory and cognitive ability that occurs in AD. Riluzole is a glutamate modulator that has been shown to increase astrocytic clearance of glutamate from the synapse, and has recently been shown to decrease cognitive decline in aging animals.

To better characterize the effects of aging, this study used RNA-sequencing to look at gene expression changes in the hippocampi of young (3 mo), middle-aged (10 mo), and old rats (14 mo). Using RNA-sequencing, riluzole was shown to prevent many age-related gene alterations in the hippocampus. There were 1,117 genes that had altered expression with age. There were 1,480 genes that were altered between riluzole treatment and aged controls. There were 435 genes that were altered both with aging and with riluzole treatment. Of these, there were 96 genes that were downregulated with age and were upregulated by riluzole, and there were 240 genes that were upregulated with age and downregulated by riluzole.

Pathway analysis done on these gene lists shows that riluzole rescues the pathways altered in aging (fig1a). The RNA-seq data was also compared to gene expression studies from the hippocampi of patients with AD, and analysis showed that many of the gene expression changes that occur with AD are reversed by riluzole (fig 1b).

Riluzole is also known to increase an astrocytic excitatory amino acid transporter's (EAAT2) ability to facilitate glutamate clearance from the synapse. RNA-seq and immunohistochemistrys show that riluzole significantly increases the expression of EAAT2 in the CA1 region of the hippocampus, highlighting a possible mechanism underlying riluzole's ability to improve cognition and memory.

A

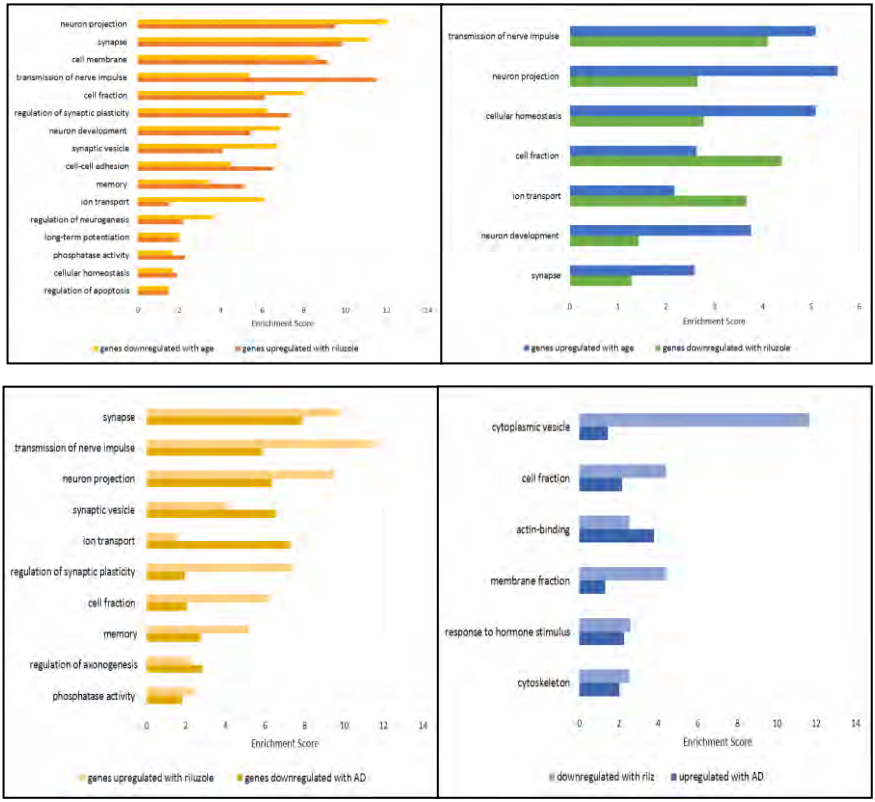

Fig 1. Riluzole rescues the pathways altered in aging and Alzheimer's disease.
Top graphs: Pathways that were significantly enriched in differentially expressed genes that were altered in aging were also altered in animals treated with riluzole.
Bottom graphs: Genes that were altered by riluzole acted in the same pathways as genes that were altered in AD hippocampi.

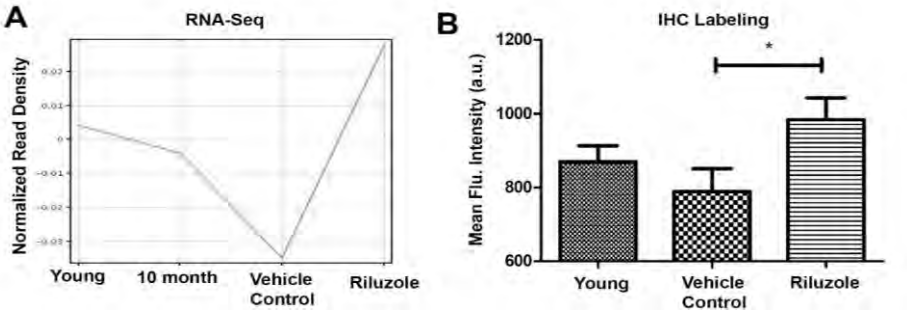

Fig. 2. A. Normalized expression values from the RNA-seq data for EAAT2 show that its expression is decreased with age (vehicle control) and its expression is restored in the riluzole condition. **B**. Fluorescent intensity levels were quantified from the CA1 region of the hippocampus that were labeled for EAAT2.

Tumor Detection via Gold Nanoparticles

By: Elisheva Elbaz[1], Prof. Dror Fixler[2], Prof. Abraham Hirshberg[3] and Ariel Ashkenazy[2]

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Early detection of cancer is crucial for effective treatment. Currently, computed tomography (CT) scans are used to detect tumors but they are inexact. Gold nanoparticles (GNP) coated with epidermal growth factor receptors (EGFR) are being researched to aid in cancer detection. They are favorable for a few reasons. GNPs are non-toxic, they have desirable optical properties and are less expensive and less invasive than CT scans.

Slides of human mouth tissue were examined with a hyperspectral microscope. Images were taken of each tissue at different wavelengths of light from 450 to 950 nm and their absorbance spectra were obtained. Then, 80 nm diameter gold nanospheres (GNSs) were then added to the tissue and the spectra were again obtained (Figure 1). The GNSs, coated with EGFR, were specially targeted to the tumor cells and concentrated there in great numbers. The two spectra for each tissue, before and after the addition of GNSs, were compared to each other to extract the spectrum for the GNSs.

Each sized GNP has different optical properties and a different peak. The 80 nm diameter GNSs have a peak at 550 nm (Figure 2). If the graph of the obtained spectrum has a peak at 550 nm, it indicates that a significant amount of the GNSs binded to the cells and it is likely a tumor (Figure 3).

Using GNPs to detect tumors can be very useful. Aside from being easier than the technology used now, it can be more exact. The exact borders of the tumors can be determined and this can enable the tumor to be completely removed.

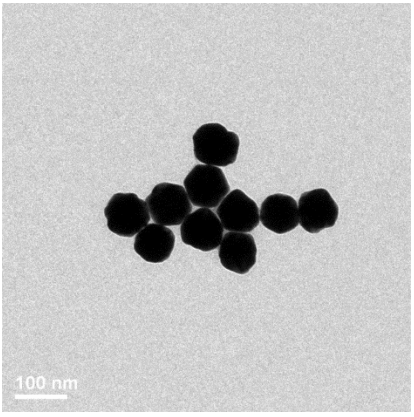

Figure 1. TEM image of GNSs with 80 nm diameter.

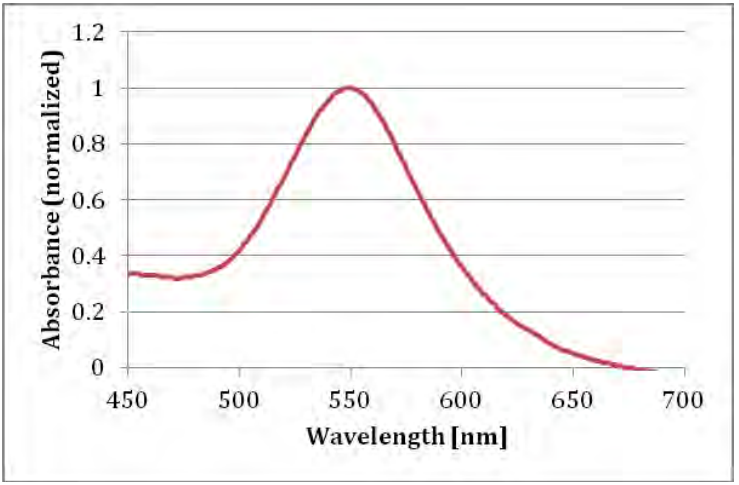

Figure 2. Absorbance Spectrum for the GNSs. The peak wavelength is 550 nm.

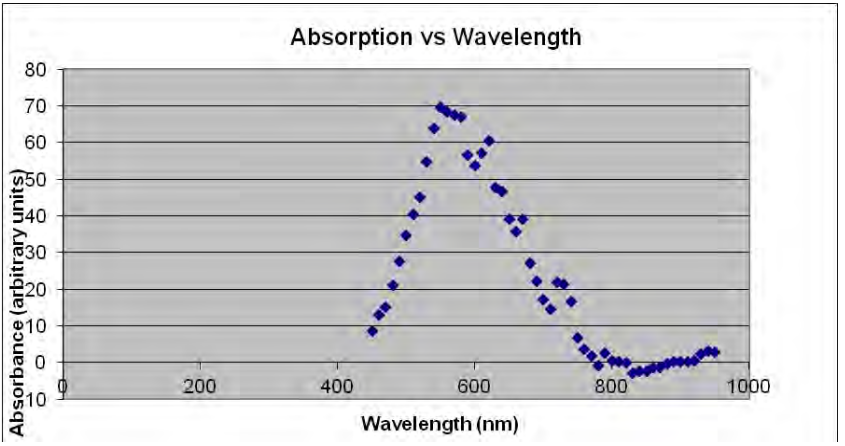

Figure 3. GNSs absorbance spectrum captured by the hyper spectral microscopy, and obtained by subtracting the spectrum of the tissue with and without GNSs. The peak is 550 nm which is the expected peak for the GNPs that were used.

Role of Atg16L1^{T316A} Mutation in Virus-induced Intestinal Disease

By: Vitya Felder[1] and Elisabeth Kernbauer[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Skirball Institute of Biomolecular Medicine, NYU School of Medicine, New York, NY

Crohn's disease, a subset of inflammatory bowel disease, affects over 700,000 Americans, and is characterized by chronic transverse intestinal inflammation related to an abnormal immune response to gut bacteria. Crohn's disease is linked to many different susceptibility loci, and one risk allele is in the ATG16L1 gene. This gene is important in autophagy – an intracellular degradation mechanism. Our laboratory previously demonstrated that mice with decreased, or hypomorphic, ATG16L1 gene expression (ATG16L1^{HM}) exhibit intestinal abnormalities similar to those observed in human Crohn's disease patients (*1*). These abnormalities were dependent on an interaction between this susceptibility gene and prolonged viral infection. This was determined by infecting ATG16L1^{HM} mice with an intestinal norovirus (MNV) and performing an analysis of their intestinal abnormalities as compared with similarly infected controls (*2*).

Specifically, this *virus-plus-susceptibility gene* interaction caused irregularities in Paneth cells, which are specialized epithelial cells crucial to mediating the intestinal microbial environment. These Paneth cell abnormalities (Figure 1) —including inflammatory gene expression and granule distribution in these cells—are consistent with those exhibited by Crohn's disease patients homozygous for the ATG16L1 T300A polymorphism that is associated with disease risk.

These novel results introduce a potential viral trigger to Crohn's disease. However, it is unclear if MNV can trigger Crohn's disease like abnormalities in mice harboring the T300A polymorphism in ATG16L1. Recently, the T300A polymorphism in ATG16L1 was shown to decrease the stability of the protein product by increasing cleavage by caspase. This result may explain why ATG16L1^{HM} mice, which display decreased ATG16L1 levels, reproduce intestinal abnormalities observed in Crohn's disease patients harboring the T300A (T316A) polymorphism. Interestingly, mice that have the equivalent of the T300A mutation in ATG16L1 display some form of the Paneth cell abnormalities we previously described. However, these ATG16L1 T300A knock-in mice (T316A mice) were analyzed in a mouse facility that harbored MNV, and the extent to which the Paneth cell abnormalities mimic the previous abnormalities we described requires clarification.

The goal for this project was to determine if T316A mice develop intestinal abnormalities in a manner dependent on MNV. In order to test this, ATG16L1^{HM}, T316A, and WT mice were infected with 1x10^6 plaque-

forming units (PFU) of MNV CR6 orally by direct pipette into the mouth. After 10 days of infection, we harvested small intestinal tissue and prepared them for sectioning. The NYU histology core prepared Periodic acid–Schiff–diastase (PAS) and alcian blue stained slides, in which and the presence of granules with abnormal morphology or absence of granules in at least 50 crypts per sample was quantified by light microscopy. As a second assay, we performed immunofluorescence staining for lysozyme and nucleic acid (DAPI), and quantified abnormalities in lysozyme distribution using a previously published scoring system *(2)*.

Our initial results indicate that, in accordance to our hypothesis, T316A mice develop severe Paneth cell abnormalities in the presence of a persistent MNV infection. However, contrary to our initial assumptions, we found that even without MNV, T316A mice present mild structural Paneth cell abnormalities, which are then greatly exacerbated by MNV. In order to investigate this finding further, future directions for this project will involve repeat MNV experiments, and electron microscopy analysis of intestinal crypts.

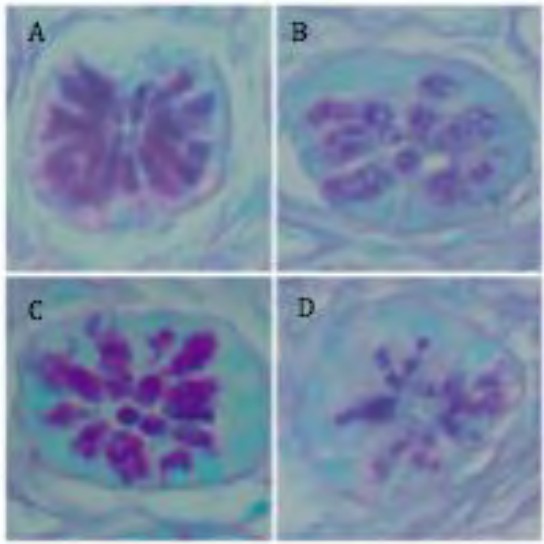

Figure 1. Murine norovirus (MNV) infection triggers Paneth cell abnormalities in *Atg16L1*^{T316A} mutant mice
(A-D) Light microscopy images of ileal sections stained with PAS-alcian blue.
(A) ATG16L1^{HM} uninfected (B) ATG16L1^{HM} infected (C) ATG16L1^{T316A} uninfected (D) ATG16L1^{T316A} infected

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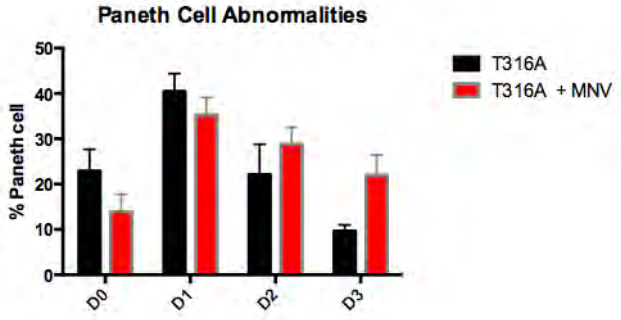

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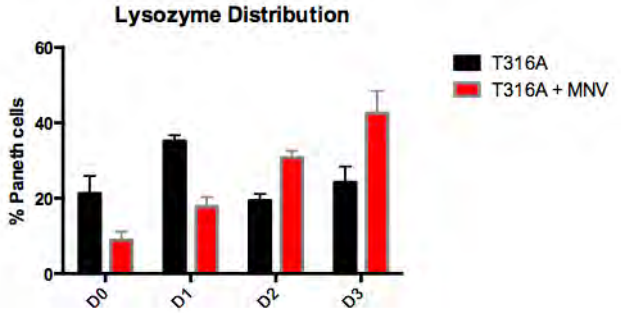

Figure 2. (E-F) Paneth cell quantification 10 days post-infection, where X axis scale refers to four types of granule distribution patterns observed in Paneth cells: normal (D0), disordered (D1), depleted (D2), diffuse (D3).
(E) Paneth cell abnormalities in ileal sections stained with PAS-alcian blue.
(F) Lysozyme distribution in ileal sections stained by indirect immunofluorescence for lysozyme and nucleic acid (DAPI).

Acknowledgments:
This research expounded upon data previously published by Dr. Kenneth Cadwell (*1,2)*. I would like to extend my appreciation to Dr. Cadwell and all the other members of the Cadwell lab, for providing invaluable assistance and encouragement, and without whom my project would not have been possible. I also owe thanks to my mentor, Dr. Jessica Linderman, for inspiring my interest in immunology and for her continued insightful and enthusiastic support. Additionally, I would like to thank the Crohn's and Colitis Foundation of America for their financial support through their Student Research Fellowship Award.

The Cytotoxic and Pro-apoptotic Effects of Apple Extract on Human Squamous Oral Carcinoma Cells

By: Aliza Friedman[1], Danielle Weitschner[1], Doreen Khakshour[1], Shoshana Mond[1], Devorah Natelson[1], Nechama Dreyfus[1], Elizabeth Bitterman[1] and Alyssa G. Schuck[1]

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Oral carcinoma is one of the most common head and neck cancers, with over 30,000 new cases each year. The development of new treatments, and the elucidation of their mechanism of action, is crucial. Nutraceuticals, the non-nutritive components of various fruits and vegetables, have been shown to provide a variety of health benefits, such as the prevention of cardiac disease, neuropathologies, and anticarcinogenic properties. Apples, like other natural products, contain both nutritive and non-nutritive components. An apple extract (AE) from the species *Malus pumila mill* was utilized in the following study to evaluate its potential anticarcinogenic activity, and to elucidate the mechanism of action of the nutraceuticals contained therein.

Previous studies in our laboratory demonstrated the selective cytotoxicity of AE toward human oral carcinoma HSC-2 cells, compared to normal gingival HF-1 and GN46 fibroblasts; HSC-2 cells were significantly more sensitive to AE treatment than were the normal fibroblast cells. In order to determine the mechanism of action of the AE toward the carcinoma cells, further studies were conducted on HSC-2 cells.

Oxidative stress has been implicated as one possible mode of cytotoxicity of some polyphenolic nutraceuticals (*e.g.* black tea extract, pomegranate extract). Other nutraceuticals exhibit little prooxidant activity; rather, their cytotoxic effects can be attributed to the polyphenols per se (*e.g.* a proanthocyanidin-rich grape seed extract). To determine whether AE exhibits prooxidant properties, neutral red cytotoxicity assays were performed in the presence of AE in conjunction with compounds that either lessen or potentiate the cellular effects of reactive oxygen species. Divalent cobalt, pyruvate, and catalase are protective agents, scavenging or catalyzing the breakdown of hydrogen peroxide. D,L-buthionine-[S,R]-sulfoximine (BSO) and 1,3-bis(2-chloroethyl)-*N*-nitrosourea (BCNU) potentiate the effects of reactive oxygen species; these agents inhibit the recycling of glutathione, one of the cell's natural antioxidant protective mechanisms, and thereby enhance cell susceptibility to oxidative stress. While the 24-hr cytotoxic potency of AE to the HSC-2 cells was greatly lessened upon exposure to AE in the presence of cobalt (NR_{50} >500 µg/ml compared to 275 µg/ml for AE alone), there was no significant effect upon cotreatment with catalase, pyruvate, BSO, or BCNU. In contrast, the 24-hr cytotoxicity of AE was potentiated in the presence of superoxide dismutase (SOD), which has been shown to stabilize polyphenols and prevent the production of their autooxidation products. Together, these results imply that the cytotoxic effects of AE can be attributed to the polyphenolic components of the extract *per se*, rather than their autooxidation products.

Using CRISPR/CAS 9 To Knockout SNF5 in HEK 293 Cells

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The ability to modify a gene in the genome is vital for genetic manipulation and genomic engineering and can be essential in the study of disease. Rhabdoid Tumor, a very rare but fatal pediatric cancer predominantly found in the kidneys, is characterized by a mutation in the gene SNF5, which will then code for non-functional proteins. In this project, we used the CRISPR/ Cas 9 system to knock out SNF5 in Human Embryonic Kidney cells in order to create a model for studying the Rhabdoid Tumor. The CRISPR system is based on the defense mechanism of bacteria against invading viruses. This system works by creating a double strand break at a specific location using a Cas9 nuclease. The cell's attempt at repairing the break is not precise, so mutations at the site of the break are common. The mutation can cause a "frame shift" if one or two nucleotides are added. This frame shift can cause an early stop codon in the reading frame of the gene, which will cause the protein to be expressed improperly (i.e. a knockout). The result of the knockout and its effects were the first step in creating a model for the Rhabdoid Tumor. There are three levels at which to analyze the effect of the knockout on SNF5: protein, functional, and genomic.

The process of analyzing the effect of the knockout in the HEK 293 cells began by growing clones of the original knocked out cells. In total, 7 clones were grown. Once there were distinct clones, a Western Blot was run to analyze the protein levels in each clone to determine if the frame shift mutation occurred. In clone 7, SNF5 did not appear, implying that a knockout occurred (Figure 1). Since the knockout of a gene can potentially have fatal effects on a cell in culture, an MTS Proliferation Assay was run on samples from each of the 7 clones in order to establish that the HEK 293 cells would continue to proliferate and to test the rate of proliferation, even in the absence of SNF5. The result shows that compared to the wild type, HEK 293 cells with SNF5 knockout will proliferate at a normal rate. (Fig.2).

In order to create a model for the Rhabdoid Tumor based on the SNF5 knockout both the type of mutation and the number of alleles on which it occurs must be determined. Since both alleles cut by SNF5 aren't repaired the same way, mutations can be on one or both alleles and might be different on each allele.

In order to determine the mutation and sequence on each specific allele, the DNA fragments containing the SNF5 gene (either mutant or wild type depending on the clone) were ligated into a T-vector plasmid. Each plasmid can only take up one fragment of DNA, and each competent bacterium can only take up one plasmid, thus ensuring that each sample sent for sequencing

is in fact one clean allele. The result of the sequencing showed that clone 7 contains a point mutation, an insertion of A/T (Figure 3), which ruins the reading frame of SNF5, causing an early stop codon (Figure 4). This explains the blank Western Blot for clone 7. This analysis is the first step in creating a model of Rhabdoid Tumor.

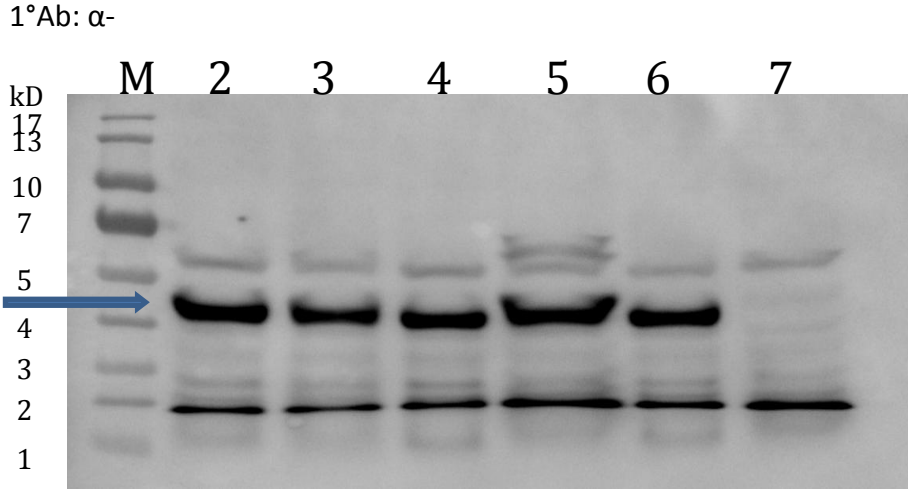

Figure 1.

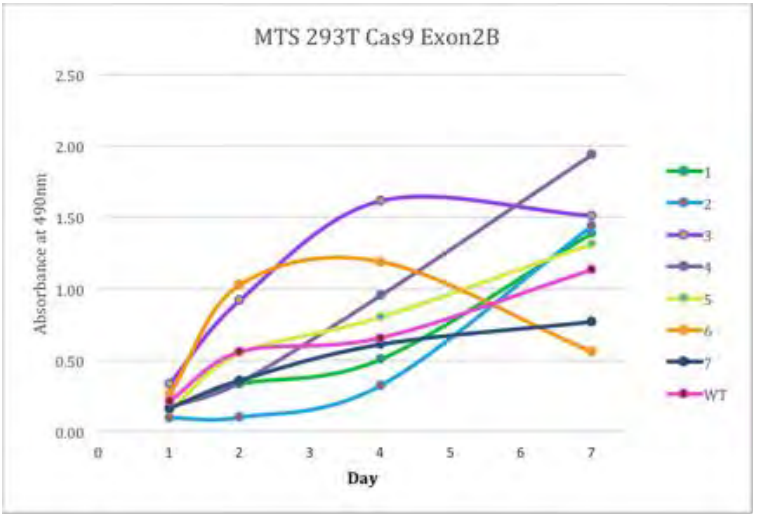

Figure 2.

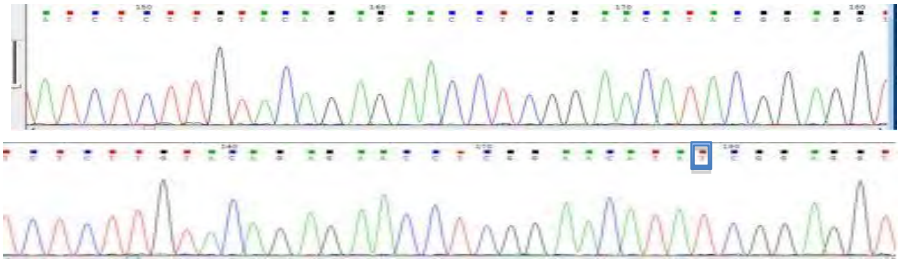

Figure 3.

Figure 4.

Determination of the Mitochondrial ATP Synthase Structure by Cryo-electron Tomography

By: Nili Greenberg[1] and Dr. Zachary Freyberg[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Psychiatry, Colombia University Medical Center, New York, NY

Although conventional electron microscopy (EM) has markedly improved our ability to resolve fine cellular features, is also carries significant limitations. Harsh chemical fixation, heavy-metal staining, dehydration and sectioning may change or obscure important intracellular features within biological samples[1]. To address this, our use of cutting edge cryo-electron microscopy (cryo-EM) and cryo-electron tomography (cryo-ET) approaches to visualize the cellular milieu allowed us to avoid these potential experimental limitations and permitted visualization of the cellular milieu in a near-native state[2]. Instead of fixatives, living cells are plunge-frozen in liquid ethane, immediately preserving their native structures. The resulting images have sufficient contrast to produce incredibly clear and detailed images. Consequently, the combination of cryo-ET imaging with new ultra-sensitive signal detection methods provided us with the capability to view a mammalian cell down to the level of single molecules and macromolecular complexes. Specifically, in cryo-ET, to determine the molecular structure of imaged objects, tomograms are first acquired from the samples. These tomograms are made up numerous individual images acquired at different angles relative to the sample and thus represent many slices of the sample's z-plane. When pieced together, they provide a three-dimensional image of cellular organelles and their components. We therefore applied these methods to the visualization of insulin-secreting pancreatic beta cells to visualize the three-dimensional structure of mitochondria, the metabolic powerhouse of these secretory cells.

In the process of our studies, we noticed small, regularly-spaced electron-dense structures arranged on the membranes of the mitochondrial cristae. We hypothesized that these structures were mitochondrial ATP synthase dimers, enzymes that facilitate the production of ATP during oxidative phosphorylation in the mitochondria. These enzymes are positioned on the cristae because their function requires a proton gradient. This gradient exists between the matrix and the intermembrane space of a mitochondrion[3]. Using a computer program, EMAN2, the coordinates of each of these individual structures within the cell were picked and recorded to facilitate the generation of an average structure, termed the sub-tomogram average. Sub-tomogram averaging is a computational device used to analyze the data for a tomogram, and essentially accounts and fills in information that is inherently missing from the three-dimensional structure. This gives a high resolution image of the structure that we are attempting to determine. When the structure of a molecule is already known from other methods, such as X-ray crystallography, it can be used as a reference[4]. To confirm whether the

structure derived from the sub-tomogram average indeed conforms to a mammalian mitochondrial ATP synthase complex, we will compare our sub-tomogram average to the known ATP synthase structure which will be used as a reference. Ultimately, if these enzymes can be imaged in healthy cells, and their structure determined under normal conditions, it will open a new pathway for the study of mitochondrial diseases. By comparing the structure of ATP synthase in healthy and diseased mitochondria, we can gain fundamental new insights into the cause of such malfunctions on a structural level.

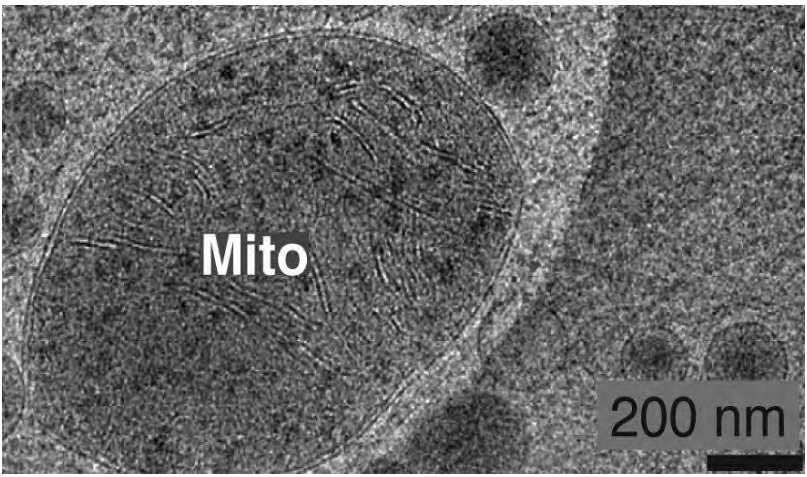

Figure 1. Cryo-EM image of a mitochondrion in plunge-frozen rat pancreatic beta cell-derived INS-1E cell. Note the fine level of detail including visualization of the mitochondrial double membrane and cristae in the absence of additional manipulations such as chemical fixation. Surrounding the mitochondrion are numerous insulin-containing secretory granules. Magnification = 10,000x; scale bar = 200 nm.

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Self-Disclosure of Positive Emotions in Close Relationships of Socially Anxious Individuals

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The emotional well-being of an individual is dependent on relationships developed and nurtured throughout one's lifetime. Relationships allow for the development of intimacy, which ultimately provides a good support system crucial to a person's emotional hygiene. Social anxiety disorder, also known as social phobia, is a disorder in which individuals experience excessive fear when placed in social and/or performance situations. For socially anxious individuals, close relationships become disrupted easily. These individuals find it difficult to interact with others, and establish and maintain relationships due to the heightened fear of being judged or misrepresenting their true selves. For this reason, socially anxious individuals tend to have fewer close relationships in comparison to non-socially anxious individuals, and also tend to overly rely on these few close relationships. However, even within their close friendships, socially anxious individuals appear to disclose less information regarding their thoughts, emotions, and experiences, thereby decreasing the benefits of intimacy and support they can potentially be receiving from their peers.

The goal of the study was to analyze patterns of self-disclosure focusing on positive experiences and emotions in close relationships of socially anxious individuals. Two separate studies were conducted and participants were asked to write about a positive experience they had within the past month. Prior to each experiment, participants were asked to identify the name of an individual with whom they felt close to, and rate how close they felt to that individual on a scale from 1-5 (not close-very close).

Study 1 (n=292) focused on the association between social anxiety and the tendency to disclose positive emotions and experiences. In this study, participants were requested to write about three different events during which they experienced pride, joy, and closeness. Participants wrote these narratives as if they were writing to a stranger and were then asked to depict the same exact emotional experience, however, this time around they were asked to address their writing to the person whom they previously designated as their close friend.

The goal of study 2 (n=226) was to determine whether patterns of self-disclosure are malleable in socially anxious individuals and whether an increase in self-disclosure is associated with an increase of positive affect in socially anxious individuals. Study two focused on experiences of closeness and joy. Narratives from both studies were then coded for words that are related to emotions and words indicating specificity of experience, including

time, location, and duration of said experience. Phase one entailed determining coding criteria and training the coder in applying those criteria to judgments of the narratives. In phase two, the coding was completed and recorded. In the future, additional raters will code the data and interrater reliability will be assessed.

Although analysis of the data is at the very beginning stages, current results indicate that socially anxious individuals tend to use fewer emotional words in comparison to socially non-anxious individuals. Additionally, the analysis of specificity indicates that socially anxious males do not describe their experience in a specific manner. However, with females, this effect was not found. By better understanding patterns of self-disclosure in socially anxious individuals' close relationships, an area which has previously received little attention, possible therapeutic interventions can assist these individuals in establishing stronger, closer and more intimate relationships with others.

Potential Germline Genetic Determinants of Immunotherapy Response in Metastatic Melanoma

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Melanoma is the deadliest form of skin cancer worldwide. Unlike other solid tumors, melanoma is highly immunogenic, and thereby manifests an antigen-specific immune response against tumor cells mediated by T-cells and other immune pathways in the tumor microenvironment. Consequently, recent improvements in cancer treatment have focused on immunotherapy as the best option for treating advanced or metastatic melanoma in place of systemic cytotoxic therapies.

Ipilimumab (IPI) is an immunotherapy monoclonal antibody designed against cytotoxic T-lymphocyte- associated antigen-4 (CTLA-4). CTLA-4 normally functions as an immune checkpoint by down-regulating the immune system and preventing over-activation of T-cells, thus reducing autoimmunity and promoting self-tolerance. By turning off the inhibitory mechanism of the immune system, IPI increases the proliferation of cytotoxic T lymphocytes, in order to boost recognition and destruction of cancer cells. In clinical trials, IPI almost doubled the one and two year survival rates of patients suffering from advanced melanoma, and significantly improved overall survival when combined with other therapies.

Although IPI has proven to increase overall survival and longevity of response in many patients, the objective response rate is only around 30%. Because the immunogenic potential of melanoma varies on individual level, we hypothesize that the host's inherited (germline) genomic variables may in part determine immunotherapy response. The aim of our study is to identify the potential germline factors that are associated with immunotherapy outcomes in advanced melanoma.

In this study, we used whole exome sequencing, a targeted next generation sequencing technology, in order to identify genetic variants in 45 patients who had been treated with IPI after suffering from advanced or stage III unresectable melanoma. Through gene association analysis, we have identified a chemokine receptor locus that shows strong association with immunotherapy response. Presence of the variant is believed to be associated with resistance to immunotherapy. For the most significant genetic associations, Pathway Studio software was used to look for pathway enrichment. Among the top pathways observed were those regulating dendritic cell chemotaxis and chemokine receptor activity. It is conceivable that variants may result in chemokine receptor dysfunction, thus preventing efficient recruitment of effector cells to the tumor.

While this data is highly promising, results are currently being validated in independent patient cohorts. Future discoveries may provide a more comprehensive understanding of the pharmacogenomic applicability of immunotherapy, allowing for the isolation of a subpopulation of patients that can benefit from IPI and to identify potential new drug targets that could be used to design combined treatment options.

Neuronal Engineering: the Effect of Metallic Nanoparticles on Neuronal Growth and Differentiation

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Nerve regeneration following tissue injury or disease is a major challenge in the neuroscience field. The search for regenerative agents that promote neuronal growth and repair is of great interest. Different molecules and materials have been shown to induce and affect neurite outgrowth and elongation. Previous experimentation has shown that iron oxide nanoparticles (NPs) promote neuronal growth and differentiation. Our study tested whether different metallic NPs (gold and silver) would promote significant neuronal growth and differentiation as well as the iron oxide NPs were shown to have promoted.

For experimental purposes, PC12 cells were utilized as the neuronal model. PC12 cells, derived from a pheochromocytoma (neurodocrine tumor) on a rat's adrenal medulla, serve as a common model for neuronal differentiation. In response to nerve growth factor (NGF), PC12 cells differentiate into neuron-like cells and outgrow neurites (Figure 1). In our project we incubated the metallic nanoparticles with PC12 cells and studied their effect on the cells' growth and differentiation process (Figure 2). Nanoparticles of all metals had a diameter of 20nm.

First, gold and silver nanoparticles at different concentrations were tested for their toxicities through an XTT assay, thereby determining their cell viability in the PC12 cells. The gold NPs had an insignificant toxicity effect and proved viable for the PC12 cells to uptake; the silver NPs, however, were found to be toxic to the cells.

Next, the cells' morphology was studied along their differentiation processes. The experiment composed of capturing images and measuring the neuronal growth of PC12 cells seeded on collagen-coated plates under a light microscope over the course of seven days (days 1, 3 and 7). The growth of PC12 cells was compared based on the different composites of particles added. We measured and analyzed the neurites using the NeuronJ Program, finding that there was a significant increase in the length of neurites of cells treated with the gold NPs as compared with that of neurites of the untreated cells.

Our research contributes to the field of neuronal repair, hoping to benefit pharmacological pursuits in the application and treatment of neurodegenerative diseases, such as Parkinson's, Alzheimer's and Cerebral Palsy.

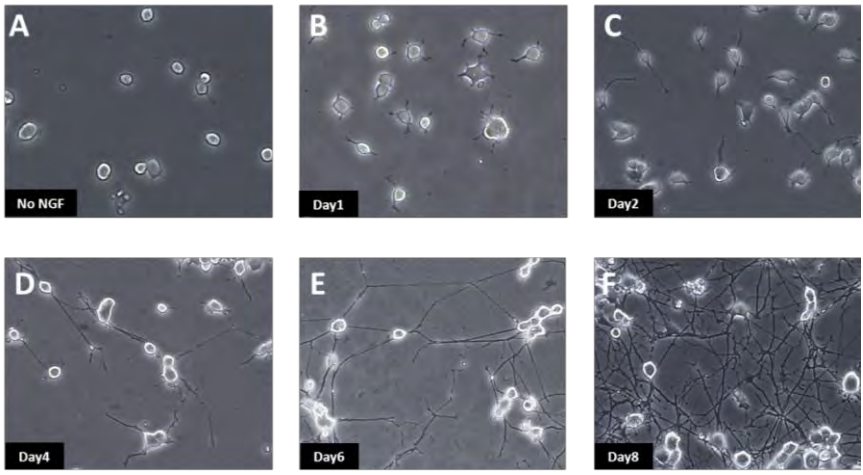

Figure 1. Neurites outgrowth by PC12 cells plated on collagen-coated plates, following NGF treatment. (A) Unexposed to NGF. (B - F) Treated with NGF (50 ng/ml) for 1, 2, 4, 6 and 8 days, respectively. Images were taken by light microscope (Imaging Magnification: 200x).

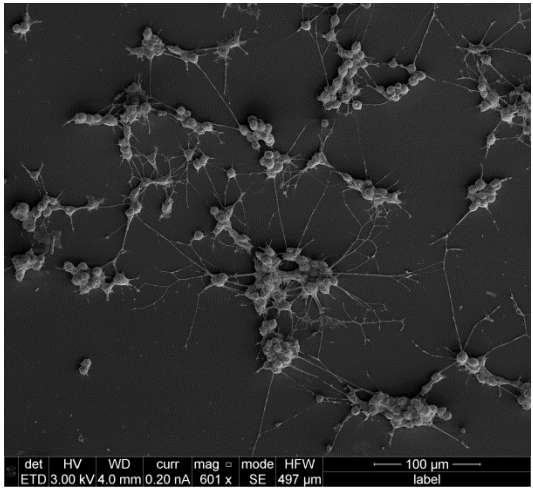

Figure 2. Neurites outgrowth by PC12 cells plated on collagen-coated plates, following NGF treatment with addition of metallic nanoparticles. Images were taken by scanning electron microscope (SEM).

Investigating the Link between Variability in Gene Expression and Protein Abundance in Ovarian Cancer Patients

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While we understand that genes are up-regulated and down-regulated in a cellular phenotype, we are beginning to recognize that variability in gene expression also has functional consequences. Limited research exists on the relationship between expression variability and average gene expression. There is also a lack of consensus regarding the best statistic to use when studying gene expression variability. Using many transcriptome-wide data sets from different microarray and RNA-seq studies, conducted on both single cell and bulk tissue samples for different cell types, we investigated the nature of how average expression and expression variability are linked across the genome. We also evaluated the performance of three common variability estimators, standard deviation (SD), median absolute deviation and coefficient of variation. The evaluation was based on the degree of correlation between the average expression and expression variability. Our results collectively point to SD being the most stable estimator to use.

Using this information, we conducted an analysis of gene expression variability and protein abundance variability using data on 174 ovarian cancer patients from the Cancer Genome Atlas. We applied an *F*-test to identify genes that had significantly higher levels of variability at the transcriptional level than the protein abundance level, or vice versa. Additionally, we also identified a set of genes that had equal variability in both protein abundance and gene expression. We looked for enrichment of different pathways that was exclusive to each of these three sets of genes in attempt to understand the biological consequences of this variability. We used the NCI Pathway Database for this purpose, as well as other annotation sources, such as MSigDB. We discovered that many of the pathways among the three groups overlapped, meaning that within the same pathway we observed different levels of variability among different genes. This led us to hypothesize that perhaps certain genes are more or less critical to the pathway in that they are expressed at the protein level or transcript level, with greater or less variability in the ovarian cancer patients. This result may even suggest that there are different points of control in pathways that are used with greater consistency. Finding which genes and proteins these points of control correspond to may identify new targets for manipulating tumors.

The SIRT6 Protein and the Molecular Mechanisms of Aging

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The Sir2 histone deacetylase is a protein that regulates genomic stability and aging in yeast. Researchers have found that this protein is not only found in yeast, but is also found in mammals. There are currently seven known mammalian homologs, SIRT1-SIRT7, that serve the similar function of suppressing genomic instability and increasing longevity. A majority of related research has been done specifically on the SIRT6 protein, which seems to have the greatest impact on mammalian lifespan. Past research has proven that there is a direct connection between the amount of SIRT6 protein in the cell and the lifespan of the cell. Absence of the SIRT6 protein in mice has been linked to developmental abnormalities that resemble age related degenerative diseases causing the mouse to die within two weeks of birth. The main molecular mechanism by which the SIRT6 protein works is by the removal of the acetylation that appears on many aging proteins. This allows the proteins, and thus the cells, to function normally and live to their fullest capacity. These studies prompted the lab of Professor Haim Cohen to further research the protein in order to elucidate the specific molecular pathways by which the SIRT6 protein is able to increase genomic stability through deacetylation.

The key to finding the molecular pathway of the SIRT6 protein is to find out with which other proteins the SIRT6 protein directly interacts. If all proteins that actively associate with the SIRT6 protein are found, it is possible to find the steps of the pathway by which the SIRT6 protein works. The specific process to find all related proteins begins by cloning the SIRT6 gene with a tag into a PGEM plasmid. The SIRT6 gene is then cut out of the PGEM with the enzyme BAMHI and is transferred to PCSC, a viral plasmid. The PCSC is grown in bacteria and the plasmid is then transferred into a virus that infects a 293T cell, a human embryonic kidney cell, making the PCSC with SIRT6 part of the genome of the cell. The cell then grows with the overexpression of the SIRT6 gene, producing large sums of the tagged SIRT6 protein. Cell lysis buffer is then used to extract the proteins from the cell. Immunopercipitation (IP) is used to isolate the SIRT6 protein with the tag. These isolated proteins are run on a Western Blot and transferred to a membrane. Once on the membrane, it is possible to use different antibodies to see which proteins aside from SIRT6 were isolated with the IP method. Any protein extracted along with the SIRT6 must have been directly attached to the SIRT6 protein, which indicates that it interacts with the SIRT6 protein in the deacetylation pathway.

There is one specific disease that it is directly related to human aging. The disease, Hutchinson–Gilford progeria syndrome, is related to the increase acetylation of the lamin A protein. It has been found that in cases where there are decreased levels of SIRT6, the lamin A protein is highly acetylated, leading to its decreased function and an acceleration in aging. In order to find out if the SIRT6 and lamin A proteins are directly related, or related through a long pathway of triggered events, the aforementioned process will be used to see if the lamin A protein gets extracted with the SIRT6 gene during the IP process.

Identifying Morphokinetic Parameters Associated With Embryo Competency

By: Nechama Lipton[1], Hanna Balakier[2], Parshvi Vyas[2,3], Katelynn Tang[4], Andrée Gauthier-Fisher[2], Clifford Librach[2,5,6]

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In vitro fertilization (IVF) is a fertility treatment that normally involves the maturation and harvest of multiple oocytes, which are fertilized in the laboratory to create embryos. These embryos grow and divide into multiple cells and, between the third and fifth day, one or more of these embryos are selected for intra-uterine transfer. Currently, embryos are primarily selected based on morphological characteristics and, in order to increase the probability that a pregnancy will occur, more than one embryo is often transferred. This increases the chance of multiple gestations and associated risks to maternal and fetal health. More effective embryo selection methods are required to increase pregnancy success while limiting the number of embryos transferred.

The introduction of time-lapse imaging to embryo culture has allowed for more detailed study of embryo growth patterns, known as morphokinetics. Current literature suggests that embryos that complete key stages of growth within specific time ranges are associated with higher implantation rates. Meseguer et al. (2011) identified five morphokinetic parameters most indicative of pregnancy success: (i) time to 2 cell stage, t2; (ii) time to 3 cell stage, t3; (iii) time to 5 cell stage, t5; (iv) duration of 2nd cell cycle, cc2 (t3-t2); (v) synchronicity of 2nd cell cycle, s2 (t4-t3). Optimal time ranges for each of these parameters were used to create an algorithm for embryo selection. A later study by Basile et al. (2014) refined these time ranges. However, it is widely thought that culture media and environmental conditions might significantly affect morphokinetic time ranges, and therefore it would be necessary for each clinic to develop a morphokinetic algorithm for its own use.

Here, we assessed whether the morphokinetic parameters and associated time ranges determined by Meseguer and Basile are suitable for use in our clinic. The IVF outcomes (clinical pregnancy) of 371 embryos in our clinic were correlated with their respective morphokinetic data obtained using the EmbryoScope® Time-lapse Imaging Software during the period of November 2013 to May 2015. We found that embryos (both freshly transferred and transferred after cryopreservation) that fell within the time ranges outlined by Meseguer and Basile for parameters t2 and t3 were associated with higher implantation rates than those that fell outside of the

determined ranges. However, we found that the time ranges reported for t5, cc2, and s2 by previous groups were not associated with higher implantation rates in our clinic. Thus, morphokinetic algorithms are not strictly universal, and must be developed for each clinic by studying a large number of transferred embryos and their IVF outcomes.

In addition, we have identified potential new morphokinetic parameters indicative of implantation and pregnancy success. Huang (2014) identified an association between morphokinetic parameters and the growth patterns of embryos following the engagement of the trophectoderm with the zona pellucida (figure 1). We explored this, and found that embryos that ultimately implanted tended to reach full engagement sooner than embryos that did not implant. Additionally, embryos that implanted were larger at the time of full engagement than those that did not implant. Further investigation and a larger sample size will be necessary to confirm these findings.

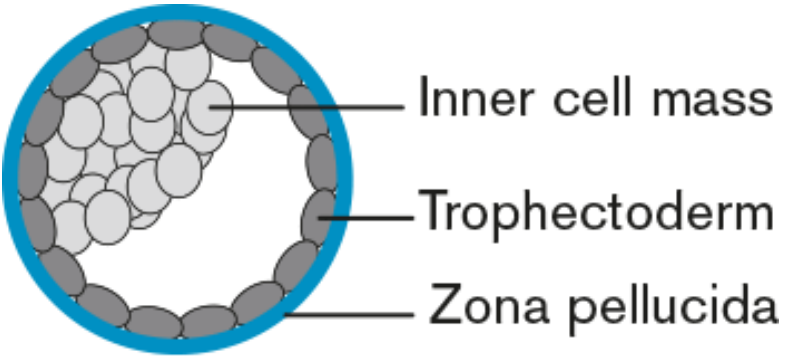

Figure 1: Embryo in blastocyst stage that exhibits full engagement between the trophectoderm and the zona pellucida.

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Meseguer M, Herrero J, Tejera A, et. al. The use of morphokinetics as a predictor of embryo implantation. Human Reproduction 26.10 Aug 2011: 2658-71.

Testing for Oncogene Mutations on Mouse Model Cell Lines

By: Daniella Marcus[1], Michela Ranieri[2] and Antonio Di Cristofano[2]

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PTEN is a tumor suppressor gene, that when it is mutated, leads to the deregulated phosphorylation of the PI3K cascade, which will activate AKT kinase. AKT is responsible for the regulation of many different cell functions including cell survival and protein synthesis (1). The mutation of PTEN is commonly found in anaplastic thyroid carcinoma (ATC) and follicular thyroid carcinoma (FTC), two forms of thyroid cancer that are responsible for most of the thyroid cancer related deaths (1).

Genetically engineered mouse models are used as an effective method for analyzing thyroid carcinoma, such as ATC and FTC. These models allow for the in vivo and in vitro study of tumorigenesis by analyzing the combinations of gene mutations that occur in the cell signaling pathways, including the PTEN/PI3K/AKT signaling pathway.

To this aim we analyzed the DNA of T7058 cell line derived from primary tumor generated in PTEN knockout mice. By PCR we tested this cell line for the mutation of genes such as HRAS, KRAS and BRAF using T683 and T4888 cell lines and a mouse tail as positive controls. The primers we used were for HRAS exons 1 and 2, KRAS exons 1 and 2, BRAF exons 11 and 15.

The results showed that T7058 cell line has the same bands as the positive controls at the predicted molecular weight, indicating that there are no deletions of any of the tested exons. However, to further understand the effects of PTEN deletion on tumor formation, we would need to sequence these exons in order to look for specific gain of function point mutations.

By characterizing the cell lines of the mouse models in this molecular fashion, we gain further understanding of the effects of PTEN deletion in the PI3K /AKT pathway. Studying thyroid tumors via the mouse models allow for a better understanding of how to effectively treat poorly differentiate

(1)Yeager, N., A. Klein-Szanto, S. Kimura, and A. Di Cristofano. "Pten Loss in the Mouse Thyroid Causes Goiter and Follicular Adenomas: Insights into Thyroid Function and Cowden Disease Pathogenesis." Cancer Research 67.3 (2007): 959-66.
(2) Dima, Mariavittoria, Kelly A. Miller, Valeria Gabriela Antico-Arciuch, and Antonio Di Cristofano. "Establishment and Characterization of Cell Lines from a Novel Mouse Model of Poorly Differentiated Thyroid Carcinoma: Powerful Tools for Basic and Preclinical Research."Thyroid 21.9 (2011): 1001-007. PubMed. Web. 4 Aug. 2015d thyroid carcinomas (2).

Learning, Odor Localization, and Neuronal Pathway as Mediated by Olfactory Stimuli

By: Jessica Mayer[1], Rikki Ranya[2], Yossi Maatuf[2], Shaked Erenfeld[2], Dr. Rafi Haddad[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Neuroscience, Bar Ilan University, Ramat Gan, Israel

The initial objective of our research was to demonstrate a connection between scent and learning, and to subsequently determine the neuronal pathway that processes olfactory stimuli and odor localization. Due to the proximity of the olfactory bulb and the hippocampus, a connection has been established between scent and memory; psychology research has demonstrated relationships between learning and memory as well. Scent and learning is thus the next logical connection to test, which, if proven, would be utilized to facilitate successful learning in the area of odor localization and reward association.

To test this correlation between scent and learning, our lab used mice in odor discrimination tasks. Mice placed on a water restriction diet had a streams of air shot at randomly chosen sides of the nose, and were trained to recognize that only the stream shot to the right side of the nose resulted in a water reward. In measuring performance with unscented or scented air streams, the olfactory system's role is tested. Owing to the hypothesized connection between scent and learning, we predicted that the mice would perform more successfully when presented with scented air. Air pressure was lowered until a threshold level of success in scented air and failure in unscented air trails was reached. While conclusive results are still pending, we have thus far found that performance in response to scented air does appear to exceed that of unscented air. If significant, these comparatively higher success rates in scented trails indicate that olfactory senses aid the learning process, and demonstrate the ability of mice to localize odors.

This finding enabled us to investigate the neuronal pathways and reactions to olfactory stimuli by electrophysical means. With the knowledge that the mice can localize odors, we were able to isolate the right and left olfactory neural pathways. Placing four tetrodes in the left, and subsequently the right, hemispheres of olfactory bulb mitral cells, we recorded the reactions of specific neurons to contralateral, bilateral, and ipsilateral scent air puffs (Fig.1). Neuronal spikes were recorded on a PST histogram (Fig. 2). Although the research is not yet conclusive, our findings showed that some of the neuronal reactions to scent are direction-dependent; certain neurons respond differently to stimuli presented at the right, left, or center of the mice. As such, the neural coding of a given scent presented at the right or left would be significantly different. These findings present the interesting quandary of how the mouse recognizes two different neural codes as the same odor. It is possible that the mouse uses only the consistent, non-

direction dependent neurons to determine odor, while they use direction-dependent neurons to determine the direction from which the odor originates.

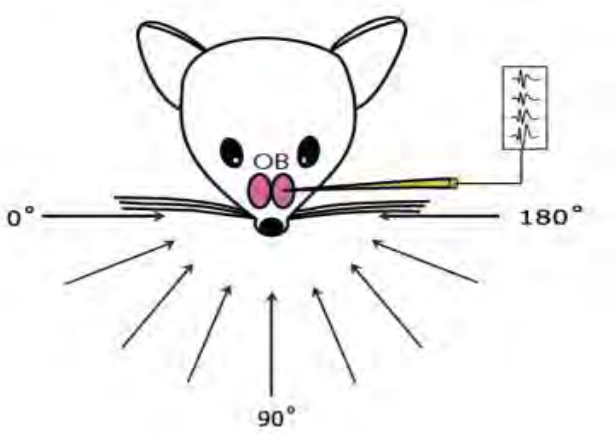

Fig. 1. Tetrode in left, contralateral, biltaral, and ipsilateral olfactory stimuli

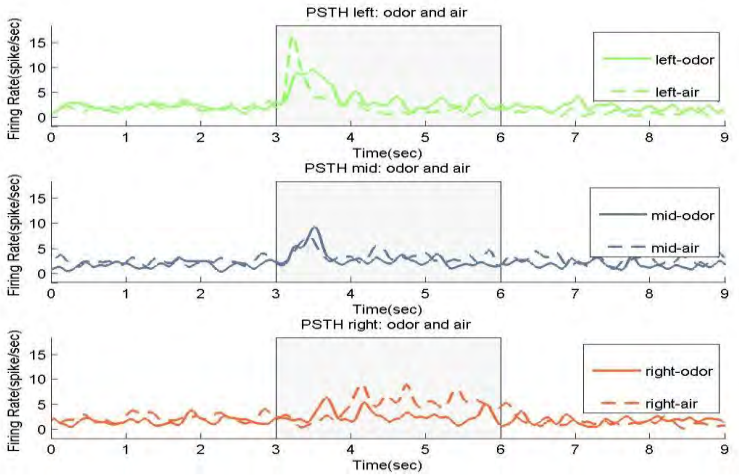

Fig. 2. Scent recognition per neuron as measured by neuronal spikes per second

The Effect of High and Low Molecular Weight Hyaluronan (HA) on the Synovium

By: Shoshana Mond[1,2], Claire Shortt[2] and Thorsten Kirsch[2]

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Osteoarthritis (OA), also known as degenerative joint disease, is the most common type of arthritis. OA is a disease not just of the cartilage but also of the joints. The synovial fluid is a thick viscous liquid that lines articular cartilage and prevents friction between subchondral bones. Synovial fluid contains hyaluronan (HA), proteinases, lubricin and collagenases that help coat the surface of the cartilage. Furthermore, synovial fluid is produced by the cells and contains all the inflammatory factors needed when studying inflammation.

Hyaloronan (HA) is a significant contributor to cell proliferation and migration. HA coats each cell (chondrocyte) in articular cartilage and is a major component of the cartilaginous extra cellular matrix. High molecular weight (HMW) HA contains several anti-inflammatory properties that can be useful during cartilage repair. In contrast, low molecular weight (LMW) HA may act as strong inflammatory mediator. While HMW binds to CD44 to induce signaling, LMW binds to cell receptors such as RHAMM or toll like receptors (TLR 2, TLR 4) to induce signaling. LMW can also become fragmented by reactive oxygen species (ROS) and hyaluronidases within the body. LMW hyaluronan fragments were generated by treating the cells with IL-1 and bovine hyaluronidase. Additionally, LMW fragments of ~10kDa were also included in this study.

It is important to determine if using a unique RHAMM mimetic peptide, which has been shown to block signaling of HA fragments and reduce inflammation leading to a regenerative healing of skin wounds, works in synergy with HMW HA to prevent the development of OA. The current study investigates the effects of LMW HA and HMW HA on a synovial fibroblast cell line (SW982).

High concentrations of LMW HA were seen induce a catabolic effects on synovial fibroblasts. Additionally, TLR 2, an HA receptor on the SW982 cell line, showed high expression in the presence of IL-1. Importantly, the synovial fibroblast cell line showed a synergy between HMW HA (Orthovisc) and the peptide *in vitro.* This synergy reduced catabolic events, decreased inflammation and progression of cartilage degeneration of OA and interfered with the binding of LMW HA of synovial fluid. Additionally, HMW HA (Orthovisc) and the peptide together produce a protective effect when added to hyaluronidase. Treating patients with HMW HA (Orthrovisc)

and the RHAMM mimetic peptide shows great promise in preventing OA and cartilage regeneration.

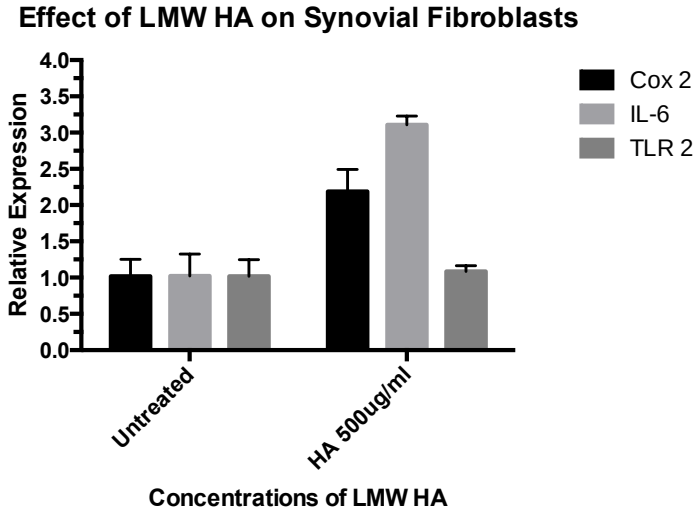


Figure 1: At high concentrations LMW HA induce a catabolic effect on synovial fibroblasts.

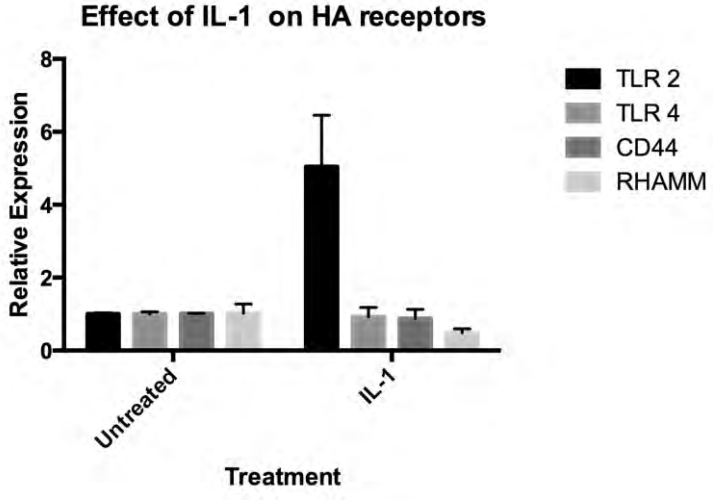


Figure 2: TLR 2 shows high expression in the presence of IL-1.

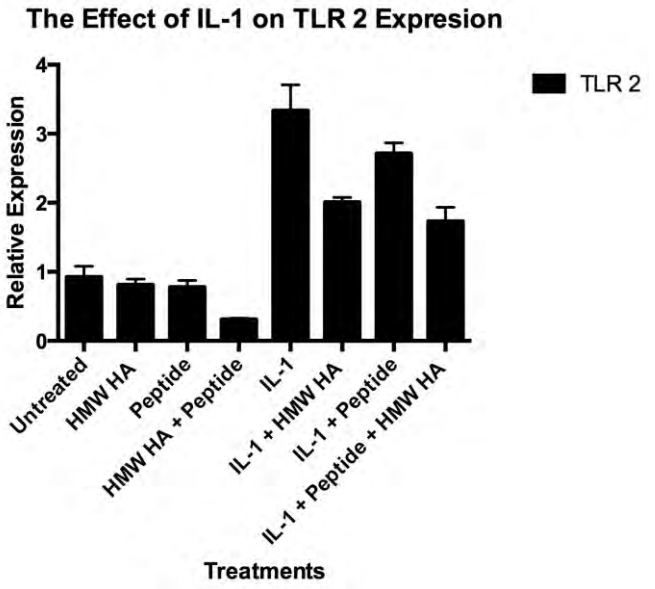


Figure 3: IL-1, HMW HA and the RHAMM mimetic peptide produce a protective effect on
TLR2 expression.

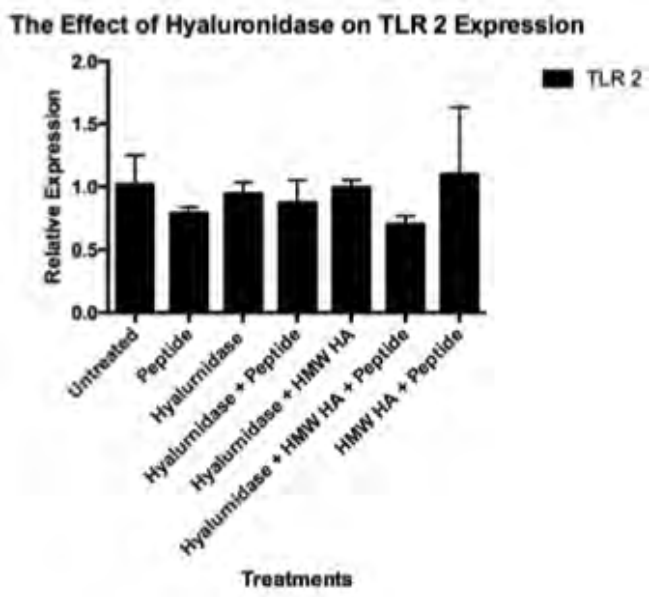


Figure 4: HMW HA and the peptide produce a protective effect when added to hyaluronidase.

PRMT5-MEP50's Role in Lung Cancer

By: Ahava Muskat[1], Hongshan Chen, PhD[2], David Shechter PhD[2]

[1] Stern College for Women, 245 Lexington Avenue, New York, NY 10016. [2] Department of Biochemistry, Albert Einstein College of Medicine,1300 Morris Park Ave, Bronx, NY 10461.

Our lab studied the effects of PRMT5 and MEP50 on lung cancer function, namely metastasis and proliferation. PRMT5 is a type II arginine methyl transferase that catalyzes the symmetrical di-methylation of arginine on many types of proteins. PRMT5 is found in complex with MEP50, a WD repeat protein. MEP50 considerably improves PRMT5's methylation ability. The mechanism by which MEP50 improves PRMT5's methylation ability is not certain. Either MEP50 helps a necessary cofactor or SAM bind tighter to PRMT5 or it presents protein substrate to PRMT5. Significantly, PRMT5 is responsible for post-transcriptional modification methylation of arginine on histone proteins which affects DNA organization, the cell cycle and many other cellular functions.

Most relevant to our research is the PRMT5-MEP50 complex's role in cancer cell proliferation and metastasis. As PRMT5 plays a large role in the cell cycle, mutated or misregulated PRMT5 greatly affects cancer cells. Much research has been done showing that over expression of PRMT5-MEP50 is related to cancer and tumorigenesis. Various clinical studies have shown that there is a negative correlation between expression of PRMT5 in cancer cells and the survival probability of the patient. Our objective was to test the role of PRMT5 and MEP50 on highly invasive and proliferative A549 lung cancer cells.

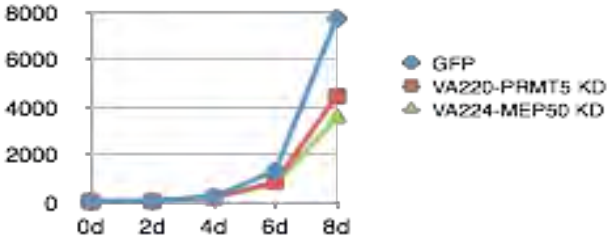
We conducted a series of assays and blots to help us reach our objective. The results from the various western blots indicate that in knockdown PRMT5 cells, both PRMT5 and MEP50 were reduced compared to the control cells. The same results were found in the knockdown MEP50 cells. Additionally, the PRMT5 knockdown cells showed less methylated arginine residues on histones 3 and 4 than the control cells. Another western blot indicated that SYM10, an important component of the cell's splicesomal machinery, was reduced in PRMT5 knockdown cells compared to the control cells.

We localized where PRMT5 and MEP50 are found in cells using immunofluorescence. The immunofluorescence results indicate that PRTM5 is located in the cytoplasm of the cell and MEP50 is located right around the periphery of the nucleus. Consistent with the western blots, the immunofluorescence results indicate that in the PRMT5 knockdown cells, both PRMT5 and MEP50 were reduced compared to the control cells. The same results were found in the MEP50 knockdown cells. The blots and

immunofluorescence results indicate that perhaps co-regulation takes place between PRMT5 and MEP50.

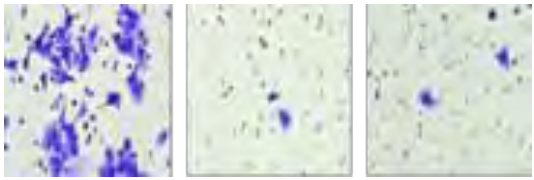
To test the proliferation of A549, PRMT5 knockdown, and MEP50 knockdown we grew the cells in medium with serum and counted the cells over the course of eight days. By the last day we saw that A549 cells had proliferated significantly more than the knockdown cells did. We did a colony formation assay over the course of 2 weeks. The colony formation assay indicates that knockdown PRMT5 and MEP50 cells show less independent colony formation than the control A549 cells. This assay is significant as it represents anchorage independent colony formation. In vitro, anchorage independent growth of cells is indicative of the actual metastatic potential of a tumor.

GFP-Control VA220-PRMT5 KD VA224-MEP50 KD



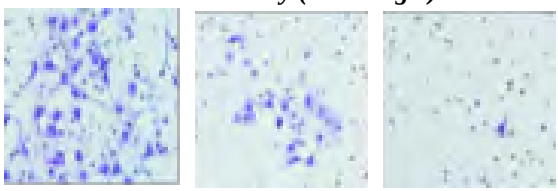
We conducted a series of migration and invasion assays. The invasion assays took place in matrigel which is similar to extracellular matrix *in vivo.* Both the Migration and Invasion assays indicated that the migration and invasiveness of PRMT5 and MEP50 knockdown cancer cells are inhibited when compared to the migration and invasiveness of A549 cancer cells. This evidence demonstrates the likelihood that PRMT5 and/or MEP50 play a vital role in promoting metastasis of cancer cells.

Migration Assay



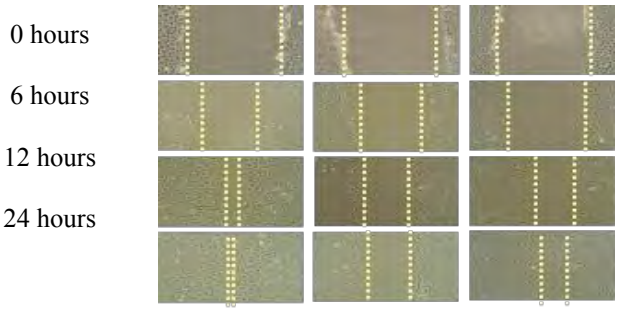
GFP-Control VA220-PRMT5 KD VA224-MEP50 KD

Invasion Assay (in matrigel)



GFP-Control VA220-PRMT5 KD VA224-MEP50 KD

We also prepared a wound heal assay. The purpose of a wound heal assay is to test metastasis. The results of the wound heal assay indicated that PRMT5 and MEP50 knockdown cells metastasized significantly less that the A549 cancer cells.



GFP-Control VA220-PRMT5 KD VA224-MEP50 KD

Overall, the results indicate that cancer cells lacking PRMT5 and/or MEP50 are impaired and cannot metastasize or proliferate as efficiently as regular A549 lung cancer cells. In the future, it is important to conduct more experiments using mutant PRMT5 and MEP50 to determine whether it is the structure or the catalytic activity of PRMT5/MEP50 that impacts cancer cell function. Eventually, it is important to test regular cancer cells with an inhibitor of PRMT5 and/on MEP50. If the inhibitor produced similar results to the knockdown cells, a novel cancer therapeutic could be made specifically targeting PRMT5 and/or MEP50.

Evaluation of Animal House Racks by Hormone Extraction

By: Devorah Natelson[1], Lee Koren[2] and Devorah Matas[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Life Sciences, Bar Ilan University, Ramat Gan, Israel

A new animal house was recently built on the Bar Ilan University campus. The University must choose between five brands of racks to purchase for this facility. These racks will hold the cages for the animals housed inside. Differences between racks include the placement of vents (e.g., on top, bottom, side, or completely detached from the racks), which is suspected to play a role in the stress that the animals experience. We are conducting an experiment in order to choose the most appropriate rack based on which model causes the least stress to the animals.

Measuring hair corticosterone, a steroid hormone found in rodents, is one way to assess stress levels. For this study, stress hormone analysis from hair samples is preferable to that of blood samples. Blood samples can show only the hormones that are circulating through the body at the time of sample extraction. In contrast, hair analysis shows the animals' stress levels over a period of time. This is because hormones are deposited into the hair shaft as it grows.

For this experiment, we placed 12 male and 12 female mice in 5 different rack brands, on the top and bottom shelves. Hair was shaved once animals arrived, and 6-8 weeks later. We are extracting hair steroid with methanol, and using commercial enzyme-linked immunosorbent assay (ELISA) kits to measure corticosterone levels in the samples. We will use this data to determine which rack brand induces the least amount of stress in the mice, and therefore which model rack should be purchased for the animal facility.

Protein TMEM16A: Opening Ion Channels for Cystic Fibrosis

By: Ayala Ouanounou[1], Kevin Coote[2], Catherine Howsham[2], Nichola Smith[2] and Catherine Solovay[2]

[1]Stern College for Women of Yeshiva University, New York, NY; [2]Novartis Institutes for Biomedical Research, Cambridge, MA

Cystic fibrosis (CF) is the most common lethal genetic disease of Caucasians. It affects 1 out of 2500 human births and there are around 70,000 patients worldwide today. It is systemic disease, which affects the entire body with symptoms such as sinusitis, arthritis, appendicitis, intestinal obstruction, bronchitis, pneumonia, heart's right ventricular hypertrophy, diabetes and delayed puberty. However, lung pathogenesis is normally responsible for the death of the patient. Despite the improvements in predicted survival these past years, CF is still a disease of high unmet medical needs. The median predicted survival age is about 36.8 years.

Let's look at the reasons why lung pathogenesis is responsible for the death or the patient:

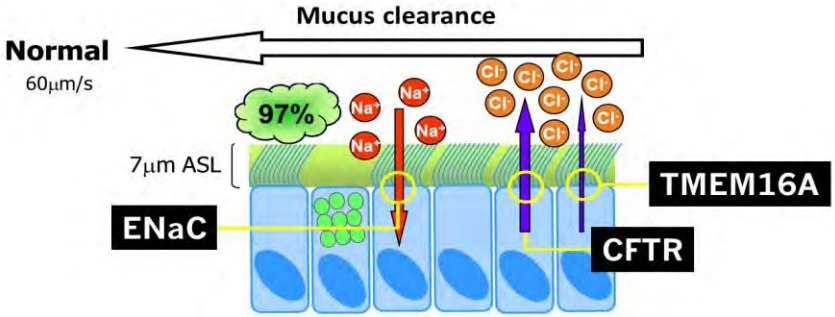


Figure 1. Functional CFTR in the lungs of a normal individual

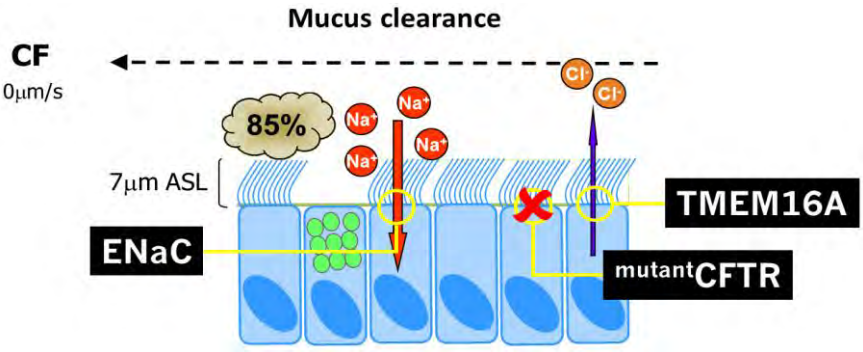


Figure 2. Mutant CFTR in the lungs of a Cystic Fibrosis patient

Cystic fibrosis is caused by the dysfunction or deficiency of the Cystic Fibrosis Trans-membrane Conductance Regulator (CFTR) protein, an epithelial chloride channel that has a key role in maintaining the homeostasis of the airway surface liquid layer in the lungs. This is known as the Low Volume Therapeutic Hypothesis. CF is a genetic disease caused by mutations in the gene encoding the CFTR Cl^- channel. The fine balance between Cl^- secretion and Na^+ absorption through the Epithelial Sodium Channel ENaC controls the thickness of the periciliary fluid. In the absence of functional CFTR, fluid absorption prevails over secretion. This imbalance dehydrates the mucus of the airway surface thereby impairing ciliary beating. Immobilized mucus then becomes a niche for bacterial survival and proliferation. The goal of the team is to potentiate protein TMEM16A in order to make it active and ideally replace the defective Cl^- secretion in the CF lungs. Calcium activated Cl^- channels in lung epithelial cells offer an alternate pathway for restoring Cl^- secretion. The proposed therapy would be an inhaled calcium-activated Cl^- channel opener, which would improve airway hydration, thus improving all the lung functions. It would also promote mucociliary clearance and reduce small airway occlusions and risks of repeated exacerbations.

One of the molecules found by High Throughput Screening was CEN466 (conformation is confidential), which had modest activity in the Q-patch assays. The challenge is to improve its physical and chemical properties and its activity by modifying the phenyl rings on the extremities of the molecule. Q-patch, solubility and Rat Clearance assays were ordered in order to test the new molecules created. The results for the Q-patch, which measures the reactivity of the molecules for potentiating protein TMEM16A, and the ones of the solubility were both too low in most cases. Therefore, these compounds were not advanced to further testing. However, testing them helped us refine the possibilities for the modification of CEN466. It also proved that solubility and metabolic clearance could be improved by modifying the CEN466 scaffold.

Acknowledgement:
The Chemistry department of Novartis Institutes of Biomedical Research provided the funding of this project. A summer stipend offered by Anastacia Berzat and Anda Veverbrants also made this adventure possible.

CDK14 Over-expression Protects against Tobacco-induced Oxidative Stress in Human Lung-derived Epithelial Cells.

By: Dena Phillips[1], Levy Agaronnik[2], Benjamin Lucas[1], Yuxuan Xiao[1] and Prof. Margarita Vigodner[1,3]

[1]Department of Biology, Stern College for Women, Yeshiva University, New York, NY, [2]Stuyvesant High School, *New York, NY,* [3]Developmental and Molecular Biology, AECOM, Bronx, New York

Chronic obstructive pulmonary disease (COPD) is currently ranked third in causes of death in the US. It is a progressive disease characterized by persistent inflammation, oxidative stress, poor airflow as a result of the inflammation, and/or loss of elasticity in lung tissues. Cigarette smoke is the leading risk factor for developing COPD. Current therapies include medicines to widen the airways, reduction of oxidative stress, pulmonary rehabilitation, oxygen therapy, and even surgery. All of these address only the symptoms of COPD. However, the molecular mechanisms underlying the disease initiation and progression are not well understood. The research done in our laboratory this summer focused on revealing the cause of COPD at the molecular level.

The WNT signaling pathway is a vital pathway for development of lung cells and has recently been discovered to play an important role in lung repair as well. Studies have shown that the WNT pathway is affected by tobacco exposure and is misregulated in patients with COPD. Additionally, WNT activation improved emphysema in experimental mouse models. Therefore, targeting the WNT pathway can be a promising approach in lung regenerative medicine; however, the question of where and how to target this pathway remains open.

CDK14 is a key regulator of the WNT pathway through its phosphorylation of the LRP6 co-receptor after creating a complex with cyclin Y. It has been identified by Dr. Vigodner's group previously as a protein that is significantly under expressed in cells exposed to tobacco smoke in testes and lungs. Understanding more about CDK14 and its role in COPD onset could eventually lead us to the development of new treatments for COPD.

The goal of the experiments performed in our laboratory this summer was to over-express the CDK14 gene in lung-derived epithelial cells and evaluate whether those cells are more resistant to oxidative damage from cigarette smoke exposure then the control cells. CDK14 over-expression was carried out by transfection of C-terminal myc-DDK-tagged human CDK14 cDNA open reading frame clone vector pCMV6-CDK14 into BEAS-2B cell line using OriGene's MegaTran 1.0 following the instructions from the manufacturer. Cells were lysed 48 hours after the transfection and the results were analyzed by western blot. This was performed by lysing cells in non-denaturated lysis buffer and loading onto NuPAGE® Novex® 4-12%

Bis-Tris protein gels for electrophoresis for 35 min at 200 volts, then transferring onto 0.45 μm pore size Nitrocellulose blotting membranes for 55 min at 35 volts. Antibodies used were mouse monoclonal anti-DDK IgG, rabbit polyclonal anti-CDK14 IgG, and goat polyclonal anti-actin IgG. After the confirmation of successful over-expression of CDK14, the transfected and control cells were treated with either 10% concentrated cigarette-smoke extract or 1×PBS as a control for 24 hours and then lysed. The lysates were subjected to oxyblot using EMD Millipore's OxyBlot™ Protein Oxidation Detection Kit following the instructions from the manufacturer. This analysis detects carbonyl residue introduced into proteins by oxidative stress. Oxyblot showed that oxidative stress was reduced in cells with an increased level of CDK14, suggesting a protective role of CDK14 against tobacco-induced oxidative stress. Therefore, a cigarette smoke-induced decrease in the level of CDK14 and the WNT pathway activity can be one of the mechanisms contributing to oxidative stress in lung epithelium, and lung diseases. The results from this research will lead to a better understanding of the molecular pathology of COPD in order to use the WNT pathway as a diagnostic and therapeutic target for lung diseases.

Profiling Prefrontal Gene Activity in Developmentally Malnourished Rats

By: Chana Ratner[1], Cyril J. Peter Ph.D[2], Janina R. Galler Ph.D[3] and Schahram Akbarian M.D., PhD[2]

Stern College for Women, Yeshiva University [1], Department of Psychiatry and Friedman Brain Institute, Ichan School of Medicine at Mount Sinai [2], The Chester M. Pierce, MD Division of Global Psychiatry, Massachusetts General Hospital, Harvard Medical School, Charlestown MA 02129 [3]

Over 100 million children worldwide do not have enough to eat, suffer from malnutrition and are at risk for developmental defects, particularly in brain. A child needs food and nutrients in order to live a healthy life and grow normally. Therefore, children who are malnourished will be affected in some way in brain function. After identifying genes that are epigenetically sensitive to malnutrition from human blood-derived DNA, we wanted to determine if there is similar alteration in gene expression in the prefrontal cortex of malnourished rats. Six such genes that are important for cognition and emotion were identified: Interferon gamma (*Ifng*), Inhibin beta (*Inhbb*), *Abcf1*, *Comt*, *Syngap1* and *Valyl-tRNA synthetase* (Vars). In the prefrontal cortex of nourished and cognitively competent rats the RNA levels for these genes were normal (moderate level) while in malnourished rats the expression of these genes were altered.

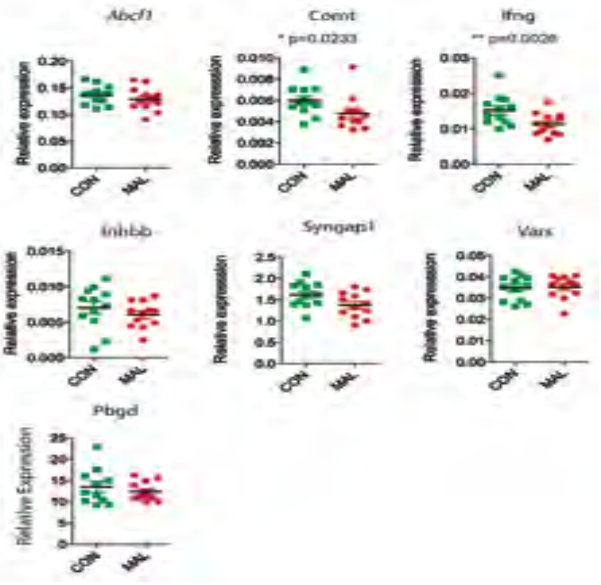


Figure 1. **Relative RNA expression pattern in rat prefrontal cortex**
Samples were taken from the control (CON) and malnourished (MAL) rat prefrontal cortex (number=12/group). Each dot on the graph represents one animal. The gene expression was quantified by real time quantitative PCR method using beta actin as a reference gene.

From the graphs we see that there was a statistically significant decrease in gene expression for both the Ifng and Comt gene (as indicated by their p values.) The graphs for the other genes were not significant but appeared decreased.

Pbdg which is a ‘housekeeping’ gene that is constitutively transcribed resulted in the same expression level for both the control and malnourished rats. For the Ifng and Comt gene, there was a decrease in gene activity. For the other genes, even though there was no statistical significance, we still see a pattern in the gene expression. In these genes, there is a general decrease in the gene expression level. Of the six genes, the Comt and Ifng genes were statistically significant with Ifng being the most significant. For all six genes, excluding the Pdgd, there was an increase in hyper-methylation pattern in the gene body and that correlates with the decrease in gene expression pattern shown in the graphs.

Improving the Health of Animals and Their Owners By Sharing Veterinary Medical Records with Physicians

By: Adira Reback[1], Dr. Peter Rabinowitz MD, MPH[2] and Dr. Michelle Funk DVM, MPH[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]University of Washington, Seattle, WA

Although animals and humans are diagnosed and treated separately by veterinarians and physicians, human and animal health is linked. According to the CDC, over six out of ten infectious diseases in humans are zoonotic, meaning they are transmitted from animals to humans. Animals may also serve as sentinels and show symptoms of environmental health hazards *before* humans do. Similarly, an abused pet may raise suspicion of domestic violence in its household. Therefore, it is important to consider ways to better share information between veterinarians and human health care providers.

These links have until now been illusive because relatively few veterinary clinics use online programs to chart medical records, meaning there are no large compilations of veterinary records – as is mainstream in human health care.

The aim of this study is to determine what percentage of small veterinary medical records suggests medical issues that affect the health of their human owners. By creating an online database of veterinary medical records and analyzing the data, veterinarians may find information that they would like to communicate to a pet owner's physician.

In this study, veterinarians reviewed medical records from over 200 small animal veterinary visits. The data collected included evidence of zoonotic disease diagnoses, environmental toxin exposure, obesity, common environmental allergens, as well as any discussion of public health risks to owner (such as mention of parasite control in households that have small children). The research is in progress and the veterinary records have not yet been analyzed. The next step will be to analyze the data and determine the categories and frequencies of medically important information occurring in the veterinary care settings. The data from this pilot study will address the hypothesis that >25% of small animal veterinary visits may contain information of human health importance.

This study will show the importance of creating a forum of communication between veterinarians and physicians, and such information sharing could take place in the form of links between electronic medical record systems. This kind of communication could improve the health of pets and their owners.

Effects of Nek1 Knockout on Primary Cilia and Nek7 Knockout on Microtubule Dynamics

By: Batsheva Reich[1], Grace Rabinowitz[2], Sivan Cohen[2] and Dr. Benny Motro[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Bar Ilan University, Ramat Gan, Israel

The mammalian NimA-related kinase genes, designated Nek1-11, encode for serine/threonine kinases which are structurally related to the fungal mitotic regulator, NimA. *Aspergillus nidulans* Never in mitosis A (NimA), is the founding member of the Nek family, and its catalytic activity is critical for initiation of mitosis. Lack of NimA activity leaves fungal cells arrested in G2, where they exhibit interphase microtubules and uncondensed chromosomes. Overexpression of NimA induces a mitosis-like phenotype, includes premature chromatin, condensation, and abnormal mitotic spindles. The NimA-related kinases (Nek's) are generally divided into three major categories. Neks 1, 11, 6, and 2 are involved in DNA damage response. The assembly and length of cilia are affected by Neks 1, 4, and 8. Neks 2, 9, 6, and 7 are related to the cell cycle.

We are currently focused on are Nek1 and Nek7. Nek1 is the largest protein of the mammalian Nek family, consisting of 1258 amino acids. It is known to play a major role in control of the cell cycle, formation and function of primary cilium, and DNA damage control. While overexpression of Nek1 inhibits the formation of primary cilia, cells missing Nek1 appear long and branched or missing altogether. To gain insight into the involvement of Nek1 in primary cilia formation and function, we began analyzing the proteins present and absent in the mutated branch. We ligated Red Fluorescent Protein, RFP, to Centrin, a centrosome protein, which will be used as another tool to mark and identify a sprouting point of the cilia. We also verified different proteins expression to the primary cilia in order to compare protein localization in wild type cells versus mutant cells.

The Nek6/7 subgroup consists of the smallest NimA-Related Kinases, with a core kinase domain and a short N-terminal tail. Nek6 and Nek7 are extremely similar and are highly evolutionarily conserved. There are multiple pieces of evidence indicating a connection between Nek7 and the microtubule network. Nek6 and Nek7 were shown to co-sediment with microtubules. Moreover, these kinases may control spindle formation through phosphorylation of Eg5, a plus-end directed motor protein that cross-links and slides microtubules in an anti-parallel direction, thereby sliding spindle poles apart. Finally, Nek6 and Nek7 are capable of phosphorylating tubulin in vitro. These findings suggest that Nek7 has a direct role in regulation of microtubule dynamics. Our goal was to mark Nek7 with RFP in order to visualize Nek7 together with EB3 and see if Nek7 localizes at the PlusTip end of the microtubule.

Trait Perception in High and Low Dominant Voices and Faces

By: Sara Rozner[1], Virginie Peschard[2] and Prof. Eva Gilboa-Schectman[2]

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Personality traits tend to be evaluated in clusters, with perceptions of one trait influencing perceptions of related traits. For instance, perception of an individual as attractive would tend to bias other positive trait perceptions, such as intelligence. This cognitive bias is called the Halo Effect (Thorndike 1920), and has been used to explain correlations between dominance and a variety of positive features, including attractiveness, achievement, and likeability (Zuckerman and Driver 1989). Additionally, although much research has focused on trait perception of faces, these evaluations have been shown to differ from those of both voices and face-voice combinations, which are more representative of real world situations (Peschard et al 2014).

The present study seeks to investigate how dominance in faces, voices, and face-voice combinations effects other trait evaluations, and whether those evaluations are moderated by raters' gender, country of origin, and individual psychological differences such as social anxiety level. Participants (n=147) were recruited from Israel and Belgium, (67 male, 80 female, mean age 27.34, SD = 10.631). In an online study, participants were presented with high and low dominant faces, high and low dominant voices, and stimuli which combined both facial and vocal cues (bimodal) which were either congruent or incongruent in terms of dominance. Participants were asked to rate each stimulus on six traits: attractiveness, friendliness, dominance, intelligence, warmth, and assertiveness.

We predicted that there would be a strong dominance halo effect, with more highly dominant stimuli rated higher in assertiveness, intelligence, and attractiveness, but lower in friendliness and warmth. Additionally, we expected bimodal stimuli to have a higher dominance effect than unimodal stimuli because of the additional information available from two modalities. Our hypothesis was partially supported; dominance was found to have a significant effect on all trait ratings across modalities, including friendliness and warmth, with high dominant stimuli rated higher in all six traits than low dominant stimuli. There were some significant differences in trait rating based on modality, with voices rated higher than faces in handsomeness, friendliness, and warmth. Counter to expectations, bimodal stimuli were rated lower in dominance than faces or voices alone. Although there was no main effect of raters' gender, there was a highly significant effect of country on all trait ratings, with Israelis giving significantly higher trait ratings than Belgians across all traits and modalities.

In a second stage of data analysis, we will seek to investigate whether dominance perception is further moderated by participants' levels of social anxiety. Investigations of Social Anxiety Disorder (SAD) indicate that socially anxious individuals have heightened sensitivity to displays of dominance, and have a lower threshold for dominance perception than not-socially anxious individuals. We predict, then, that participants with higher levels of social anxiety will rate stimuli as higher in dominance than their non-socially anxious counterparts.

Hemispheric Roles in Semantic and Phonological Processing in Speakers of Native and Non-Native Languages

By: Amalia Schwartz[1], Prof. Nira Mashal[2] and Katy Borodkin, Ph.D[3]

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The right hemisphere (RH) of the brain is presumed to have a more central role when acquiring new skills while the left hemisphere (LH) is more critical during the later stages of learning. This can be applied to semantic and phonological processing in a person's native language. According to the Fine vs. Coarse semantic coding theory (Beeman, 1998) the right hemisphere activates a larger range of semantically related words than does the left (Faust & Mashal, 2007). As a result, responses to semantically related words, albeit distantly, are faster and more accurate in the left visual field (LVF)/RH than the right visual field (RVF)/LH. In the current study we test whether the LH plays a more central role for native language (L1) processing, which in this study is Hebrew, while the RH has a dominating role for non-native language (L2) processing, in this case, English.

A previous tachistoscopic study, suggests that speakers process words presented in their native language in the RVF/LH faster and more accurately than words presented to the LVF/RH. However, the opposite is true for non-fluent speakers of a non-native language, suggesting that the RH plays a more important role for secondary language (Karapetsas & Andreou, 2001). Previous research also indicates that Hebrew speakers show no visual field advantage (i.e., bilateral pattern of hemispheric processing) in processing English but do show a RVF/LH advantage when reading Hebrew. This suggests that there is a division of labor between the two hemispheres based on linguistic experience (Ibrahim, Israeli & Eviatar, 2010).

The present study uses a divided visual field paradigm in order to examine hemispheric processing of word pairs in Hebrew as L1 and English as L2. Participants in the study will include a sample of native Hebrew speakers who learned English as a secondary language. Participants will undergo two experiments, one in Hebrew and one in English. The stimuli will include 240 word pairs in each experiment in which the target words will be presented to either the RVF or the LVF. The word pairs are either semantically related (ex: *sky-cloud*), phonologically related (ex: *rule-tool)* or unrelated (ex: letter-duck). Participants will decide whether the target word is a real word or not (a lexical decision task). In order to construct the stimuli, questionnaires were distributed in order to counterbalance the rate of word frequency and semantic relationships between conditions.

We hypothesized that responses in the native language experiment, which in this case is Hebrew, will be faster in the RVF/LH for phonological- conditions, and no hemispheric advantage in the other conditions. However, the opposite is expected in the non-native language experiment. Responses are expected to be slower in the RVF/LH compared to the LVF/RH for phonological- conditions. Again, no hemispheric advantage is expected for the semantic processing conditions. This would support the hypothesis that hemispheric involvement in native and non-native language processing depends on linguistic experience. This could suggest that phonologically related pairs are learned separately for each language while semantically related words can be conveyed across languages.

This research was done under the helpful supervision of Professor Nira Mashal and Dr. Katy Borodkin.

Environmental Influences on Domestic Cat Stress Levels

By: Tehilla Sollofe[1] and Dr. Lindsey Vansandt[2]

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Over the past twenty years products such as Feliway®, a synthetic cat pheromone that signals the F3 fraction of feline facial pheromone released during rubbing, have been prescribed by veterinarians to reduce stress in home environments. Through anxiolytic means, it reduces unwanted feline behaviors induced by environmental stress. There is clinical research that supports Feliway®'s efficiency in home environments.

According to the ASPCA there are approximately 3.4 million cats living in shelters. Conditions such as an unfamiliar environment, pre-existing dominant societies, restraining, and cage confinement greatly contribute to elevated stress levels (Kessler and Turner, 1999; McCobb et al. 2005; McCune, 1994) which in turn lead to increased susceptibility to disease (reviewed by Griffin, 1989). In an ongoing study at the Cincinnati Zoo and Botanical Garden's Center for Conservation and Research of Endangered Wildlife (C.R.E.W.) the effectiveness of Feliway® and hierarchical living stress in a shelter setting is being studied. For several months fecal samples, rectal swabs and behavior footage has been collected on twelve, female, domestic cats to test fecal corticoids, fecal secretory IgA, and fecal feline coronavirus (FCoV) shedding. Preliminary results, though inconclusive, show that removal of dominant cats reduces cortisol levels, especially in one of the dominant cats removed.

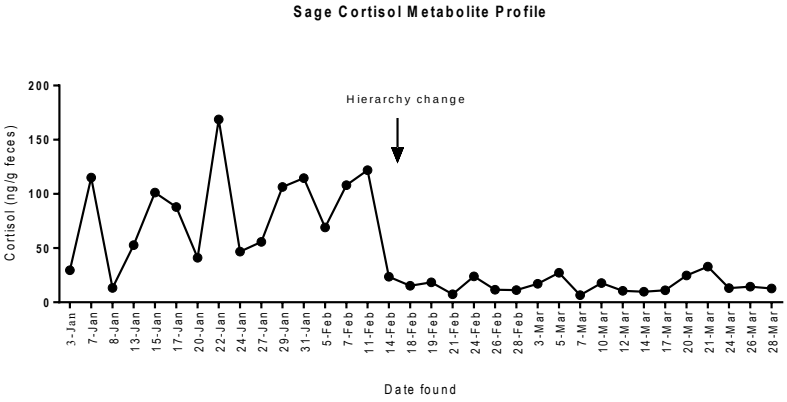
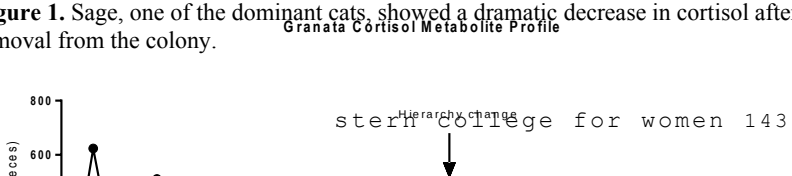


Figure 1. Sage, one of the dominant cats, showed a dramatic decrease in cortisol after her removal from the colony.



Formation of BSA Microspheres by Ultrasonic Cavitation and Investigation of Their Chiral Interactions

By: Yael Steinberg[1], Vijay Bhooshan Kumar[2] and Prof. Aharon Gedanken[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Chemistry, Bar Ilan University, Ramat Gan, Israel

The laboratory of Professor Aharon Gedenken focuses on the field of Sonochemistry. The laboratory utilizes ultrasound waves for fabricating new materials for applications that include antibaterials, bio-imaging, and catalysis.

My research work focused on one step sonochemical formation of BSA microspheres and their chiral interaction with several amino acids. We examined the interactions between these microspheres and racemic mixture of various amino acids. We began the experiment by creating BSA microspheres using BSA aq. solution and Dodecane. After formation of BSA microspheres, 10 mL of microspheres were added to 10 mL of each DL amino acid solution. These mixtures were placed inside dialysis bags for dialysis of the unreacted enantiomer in water. Samples were taken every 24 hours.

The samples were tested using a Circular Dichroism Spectrometer (CD) and a Polarimeter. This analysis confirmed that there are some enantiomeric interactions between the aq. solution of racemic mixture and BSA microsphere. We are still in the process of processing our data, but early results have been promising.

Understanding of the role of CDK14 in tobacco-related diseases

By: Allison Tawil[1], Rachel Yarmush[1], Yuxuan Xiao[1] and Margarita Vigodner[1]

[1]Department of Biology, Stern College for Women, Yeshiva University, New York, NY

Chronic obstructive pulmonary disease (COPD) is the third leading cause of death in the United States, and is most commonly caused by tobacco smoke. The bronchioles of the lungs end in many tiny alveoli, collectively creating a large surface area, which allows for normal oxygen intake by the lungs. One of the pathological changes which would cause COPD onset is the degradation of the lung tissue separating alveoli. Due to this phenomenon, the many alveoli of the lungs merge into a single, large alveolus, which decreases the surface area for gas exchange. This would lead to a reduction of oxygen intake, which would cause the feeling of impaired breathing. Other symptoms of COPD include wheezing, shortness of breath, and chest tightness.

Cyclin-dependent kinase 14 (CDK14) is a new member of cdc2 related cell cycle regulators. It is a gene that helps a cell progress normally through the cell cycle and also is involved in molecular signalling in lung epithelial cells. Previous research in Vigodner's lab found that tobacco smoke caused down-regulation of CDK14 in different tissues and cell lines including primary human bronchial-derived cell lines.

Since lungs are the first organ to be affected by tobacco smoke, this study sought to compare the difference in *cdk14* expression in lung tissue of people with COPD and without COPD. Two cell lines were used to mimic the tissue of diseased and non-diseased lungs. Normal human bronchial epithelial cells (NHBE) were used to mimic normal lungs, and were isolated from the epithelial lining of airways in the lungs of normal humans. Diseased human bronchial epithelial cells (DHBE) were used to mimic lungs affected by COPD, and were isolated from the epithelial lining of airways in the lungs of humans with COPD.

Real-time polymerase chain reactions (qPCR) were carried out in this study. The exclusive benefit of using qPCR is that the amplified DNA is detected, or quantified, as the reaction progresses in “real time.” Since qPCR is able to show the quantity of the transcription of a specific cDNA as it is progressing, it demonstrates the expression efficiency of a gene. Real-time PCR would therefore allow for the detection of any difference in *cdk14* expression in the two cell lines. This is a more suitable approach compared to standard PCR, where the product of the reaction is detected at its end and the expression efficiency of a gene cannot be determined. The results of the qPCR show that the expression of *cdk14* is down-regulated in DHBE cells than in NHBE cells, as shown in Figure I. This suggests that the DHBE cells have less

CDK14, and therefore may be defective in cell cycle regulation when compared to the NHBE cells.

This study shows that CDK14 is down regulated in the DHBE cell line, which implies a probable down regulation of this protein in COPD-affected individuals. These results also suggest a putative relationship between the change in *cdk14* expression and COPD. Since cyclin-dependent kinases regulate the cell cycle, the down regulation of CDK14 may result in cell death or abnormal molecular signaling, which may lead to tissue degradation and cause some of the symptoms of COPD.

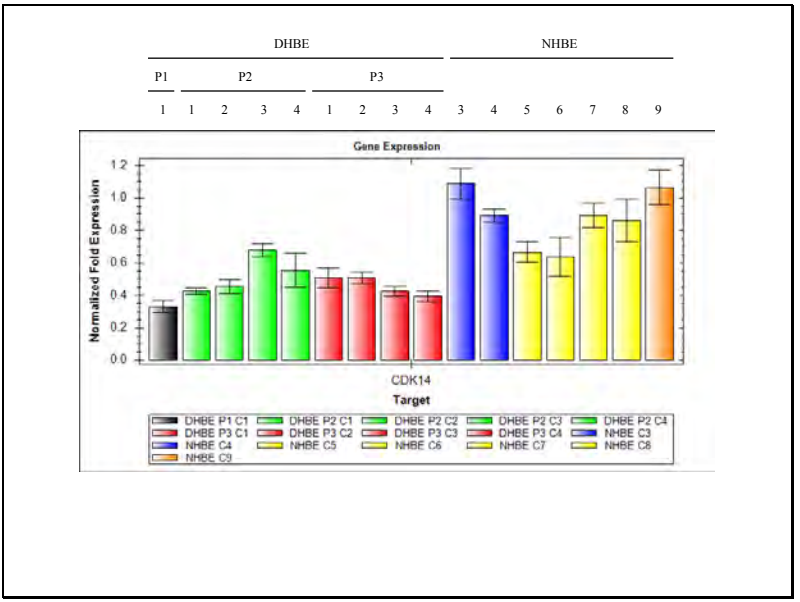


Figure 1. This graph illustrates the decrease of CFK14 production in DHBE cells as compared to NHBE. Different cell passages and time points were analyzed.

MicroRNA Involvement in Targeting AChE in Stroke Patients

By: Alita Teitz[1] and Shani Shenhar-Tsarfaty [2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Biological Chemistry, The Hebrew University of Jerusalem, Jerusalem, Israel

Acetylcholinesterase (AChE) is an enzyme whose circulating activity can be measured for the purpose of mild stroke diagnosis. AChE levels can also be correlated to the risk of lung infection and the mortality rate in stroke patients. AChE hydrolyzes acetylcholine, which suppresses inflammation. It has been shown that specific microRNAs, small RNA molecules which are active in gene regulation, target AChE and in this manner regulate inflammatory response (Fig. 1). With this information in mind, we will sequence the microRNA of stroke patients with different prognoses. In addition, we will use data from mice with induced strokes to track the changes in microRNA regulators of AChE. We hope that this will provide some much-needed insight into ischemic stroke and lead to improved diagnoses and survival rates for stroke patients.

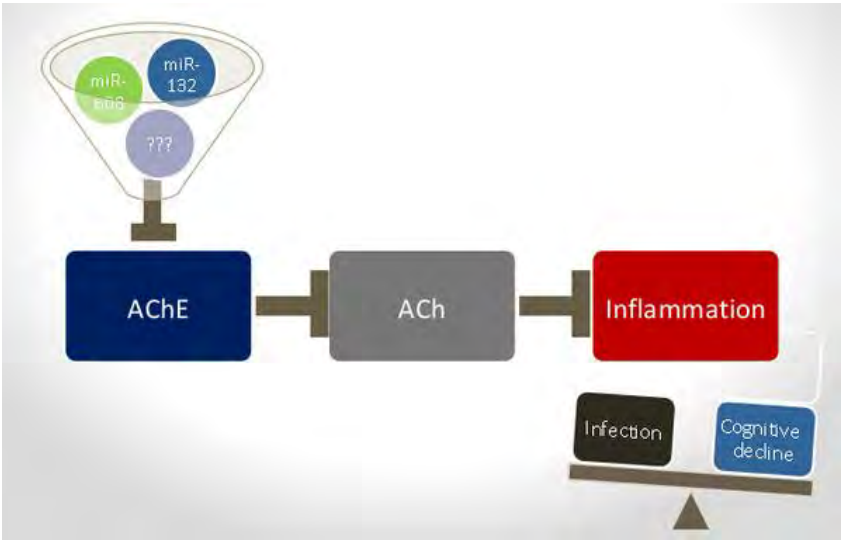


Figure 1: MicroRNA influence in the cholinergic pathway post-stroke

Development of Neuroligin-2 Mimetics as a Novel Anti-Diabetic Treatment

By: Rebecca van Bemmelen[1], Anna Munder[2], Shirin Kahremany[2], Efrat Shtriker[2] and Arie-Lev Gruzman[2]

[1]Stern College for Women, Yeshiva University, New York, NY; [2]Department of Medicinal Chemistry, Bar Ilan University, Ramat Gan, Israel

The basis of this research is to develop an anti-diabetic treatment by synthesizing a compound that will cause pancreatic β-cells to increase their production of insulin even if they are under stress conditions. This is because the loss of β -cell functions, specifically the ability to secrete insulin and respond to glucose, plays a major role in the progression of type-2 diabetes. It was recently found that similar to neurons, pancreatic β –cells contain anchor proteins: neuroligins and neurexins on their plasma membrane which help guide 3D intracellual formation and interactions between β –cells. Such proper 3D formation of several β –cells in one conglomerate allows proper production and secretion of insulin. Among these β –cell proteins, neuroligin-2 (NL-2) and neurexin-1 (NX-1) are the most important ones.

Through computer based molecular modeling our lab determined the binding site of the NL-2 to which NX-1 binds, and this nine amino acid peptide (HSA-28) was then synthesized and conjugated to a dendrimer nanoparticle to form the compound HSA-28D (the cluster of HSA-28, Figure 1). We hypothesized that HSA-28D interacting with a NX-1 on the *β*-cell-surface would modulate insulin expression and secretion, improve *β*-cell resistance to cellular stress, prevent apoptosis and increase β-cell mass. To test our hypothesis, we co-cultured the HSA-28D with rat INS-1E cells, which are used as an in-vitro model for β-cell study. The obtained results showed that when cells were co-cultured with varying amounts of HSA-28D, the amount of cells greatly increased. In addition, we determined that with increased cell proliferation, the intracellular level of insulin was significantly elevated in the cells treated by HSA-28D. This was measured by the estimation of the levels of C-peptide (green signal, Figure 2), a component of the insulin precursor which is used as a marker for insulin secretion. Finally, we also found that HSA-28D had a positive effect on the β-cells viability even in the presence of ER and oxidative stressors (Figure 3). We hope that HSA-28D and other NL-2 mimetic compounds will be promising therapeutic agents for diabetes, and that they can be used for creation of stem cell derived artificial islets for future transplantation in diabetic patients.

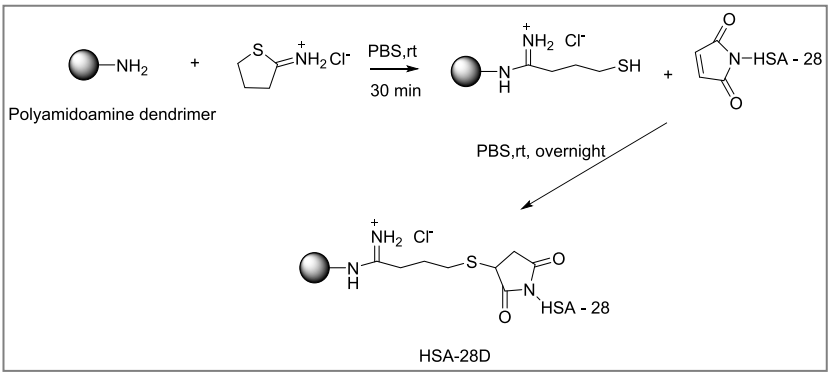


Figure 1. HSA-28 conjugation to polyamidoamine dendrimer (nanoparticle)

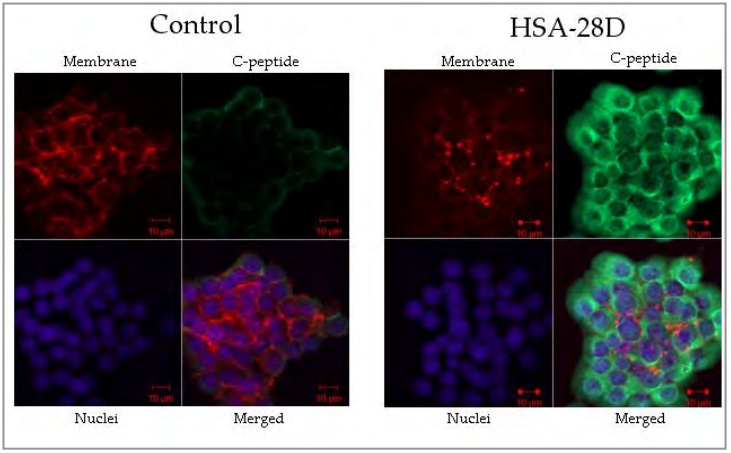


Figure 2. Effect of HSA-28D on C-peptide level in INS-1E cells, visualized using anti C-peptide antibody followed by secondary antibody-green signal

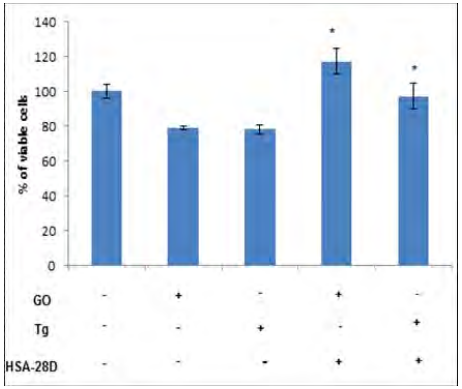


Figure 3. The Effect of HSA-28D on cell viability under oxidative stress and ER conditions

The Combined Effects of Resveratrol and Rapamycin on TSC null Diseases

By: Sara Leora Wiener[1], Adi Y. Berman[1], Anya Alayev[1], Rachel S. Salamon[1], Yang Sun[2], Naomi S. Schwartz[1], Jane J. Yu[2] and Marina K. Holz[1,3]

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Tuberous Sclerosis Complex (TSC) is an autosomal dominant disease that results from the hyperactivation of mammalian target of rapamycin (mTOR). The mTOR signaling pathway has emerged as a major node of cellular metabolism, cell proliferation, autophagy and immune response regulation. TSC null diseases, such as TSC1 null urothelial bladder cancer, are characterized by the functional loss of the tuberous sclerosis complexes 1/2 (TSC1 and TSC2), which are responsible for negatively regulating mTOR and maintaining cell homeostasis.

The upregulation of mTOR stimulates tumor growth and proliferation and promotes the activation of its downstream targets, such as the 40S ribosomal S6 kinase 1 (S6K1) and S6. Rapamycin, an mTOR inhibitor, has clinically been used to treat TSC, however the inhibition of mTOR kinase activity stimulates autophagy and suppresses the negative feedback loop to Akt. The Akt pathway stimulates cell growth, and therefore rapamycin therapy is only partially effective and the disease is allowed to progress upon cessation of rapamycin treatment.

Our research investigates whether a combinatorial approach of mTOR and autophagy inhibition with rapamycin and resveratrol, a naturally occurring polyphenol that has several known medically beneficial properties, may prove a more effective treatment for TSC. When TSC1 null and TSC2 null MEFs were treated with both rapamycin and resveratrol, autophagy was inhibited and apoptosis was initiated, as shown primarily by levels of protein markers for Akt, autophagy, and apoptosis. Mouse xenografts show that *in vivo*, the rapamycin/resveratrol combination reduced TSC2 null tumors more so than those treated with only one drug. When tested in human bladder cancer cells, some of which contained the TSC1 mutation, the rapamycin/resveratrol combination produced a similar effect regarding increased apoptosis and autophagy inhibition.

Our results indicate that the use of resveratrol in conjunction with rapamycin proves to be a more thorough treatment for TSC1 null and TSC2 null diseases by inhibiting mTOR, preventing autophagy, and stimulating apoptosis.

The Importance of Media in Cardiac Regeneration

By: Natasha Zadikoff[1] and Ian A. White[2]

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In mice, the neonatal heart has shown the transient ability to repair itself in response to injury. To study this phenomenon, researchers make cuts in the ventricles or resect the apex and monitor the regeneration within the injury sites. Twenty one days following an apical resection, neonatal mice show full regenerative response to injury, complete with recellurization and differentiation. Histological analysis of the neonatal response shows little to no difference between the cells within the injury site and surrounding tissue. Cardiac regeneration in the body is not in a fully defined environment, which complicates research. Many factors are impossible to regulate and study, so researchers remove the heart from the chest and place it into a regenerative media. The components of this media provide the cells with the required proteins and growth factors to keep them alive and allow them to fully regenerate in a controlled environment available for study. The media used within the lab was not originally intended for use as a regenerative culture media, so we chose to test it for redundancies. The question we addressed was whether or not all components of the selected media are necessary for regeneration.

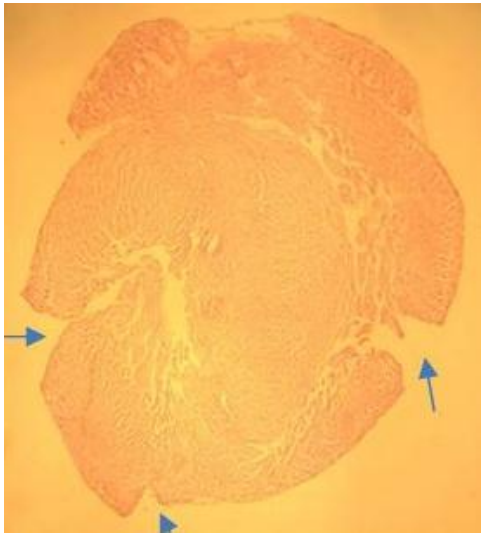

Figure 1: H&E stained section of heart. Injury sites indicated with arrow. No regenerative response initiated

To investigate this, we aimed to qualify observational differences in growth between different conditions. Each condition was lacking one growth factor. In a test condition, if tissue showed signs of regeneration, it would render that growth factor to be redundant. If the tissue did not regenerate as compared to positive controls, that growth factor would be deemed critical for regeneration. Hearts were placed into the incubator and submerged in growth media, and harvested for study after ten days. Comparison between the test conditions and the positive control showed that none of the hearts in the test groups regenerated to their full capacity as compared to positive controls. However, responses varied between the different conditions. In tree test conditions, there was no observable tissue regeneration. Those injury sites remained as large gaping holes with jagged edges (Fig. 1). In one test condition, analysis seemed to indicate that the epicardium of the heart had activated and formed a cap over the injury, but it did not fill in the injury site. (Fig. 2). This suggests that the factor omitted from that condition may not be critical for the first steps of regeneration but it is required for recellurization to occur. From these experiments we conclude that all factors tested are absolutely critical for regeneration. These results allow our lab to further the study of regenerative therapy in the heart with certainty that our selected media is necessary for regeneration and does not contain redundancies. Cardiac regeneration in a mammalian model is a revolutionary find, with great implications for regenerative therapies for the human heart.

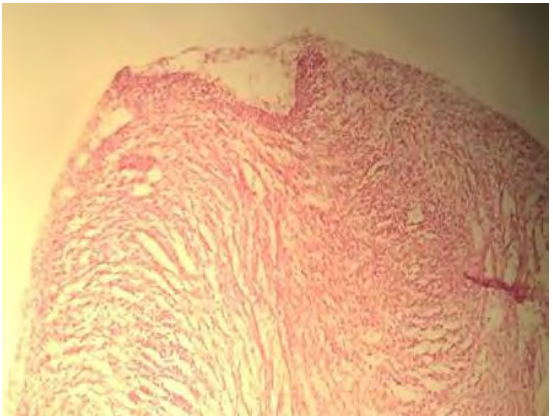

Figure 2: Magnified section of epicardium capping injury site. Note the lack of regeneration within the injury.