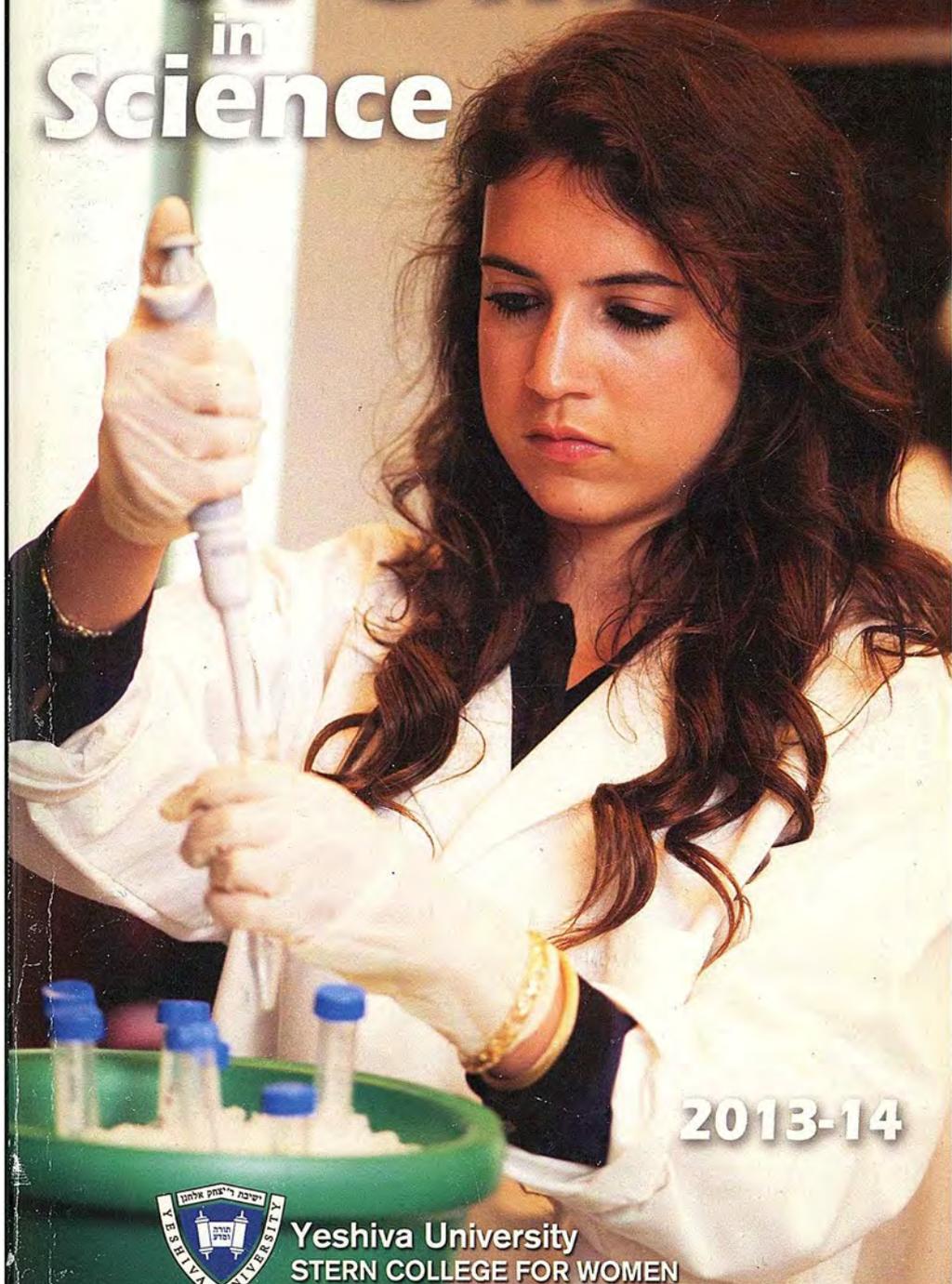


WOMEN in Science



2013-14



Yeshiva University
STERN COLLEGE FOR WOMEN

Women in Science

2013-2014

VOL. X



Yeshiva University
STERN COLLEGE FOR WOMEN

Table of Contents

Acknowledgments	4
Introductory Remarks	5
Department of Biology	13
Department of Chemistry and Biochemistry	21
Department of Physics	27
Department of Psychology	29
Combined Programs	33
Summer Research at the Albert Einstein College of Medicine	36
The Anne Scheiber Fellowship Program	41
Students' Accomplishments	42
Students' Publications and Presentations	46
<i>Derech HaTeva</i> , A Journal of Torah and Science	75
Abstract Booklet of Student Research	85

Student Co-Editors:

Chana Ratner
Jacqueline Benayoun
Alyssa Lerner
Naomi Wakschlag

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 Stern College for Women, 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 co-editors of the *Abstract Booklet of Student Research*, Jacqueline Benayoun, Alyssa Lerner, Chana Ratner, and Naomi Wakschlag for their outstanding work.

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 the quality and production of this journal.

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

Cover Photo

Esther Kazlow, a participant in the Summer Undergraduate Research Program (SURP), conducting research at Albert Einstein College of Medicine.

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) provide additional undergraduate research opportunities through the Roth Institute Program. In the summer, 2014, 7 SCW undergraduates were Roth Scholars and 1 was a SERC Scholar. Beginning 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 2014, 17 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. Furthermore, the science faculties actively encourage the science majors to apply for competitive undergraduate research internships, locally, nationally, and internationally. In the summer of 2014, more than 65 SCW students were involved in research, either at SCW, AECOM (see Summer Research at the Albert Einstein College of Medicine), or external research facilities, including at Sloan-Kettering Cancer Center, Montefiore Medical Center, Beth Israel Medical Center, in the Health Careers Opportunity Program at the Rusk Institute for Rehabilitative Medicine, at Phoenix Baptist Hospital, Greater Washington Dietetics, University of Maryland, Washington University, College of Charleston, University of Colorado, Lebohn Children's Hospital (Memphis, TN), Barrow Neurological Institute

(Phoenix, AZ), and Hadassah Medical School (Israel) (see Student Accomplishments).

The Jewish Foundation for the Education of Women (JFEW) Science Fellowship Program was inaugurated in the 2009-2010 academic year, with ten participating students. Each subsequent year, an additional nine to ten students, all with interests in the sciences, joined the program. 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 oral cancer biology, biology of cell cycle, microbiology, neurobiology, physical therapy, and bioinformatics. The Fellows have interned in prestigious institutions, including AECOM, The Rockefeller University, Johns Hopkins University, Harvard Medical School, Rutgers University, New York University, and Yale University, Barrow Neurological Institute, Hadassah Hospital, and Bar Ilan University 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. Thus far, three cohorts of JFEW Fellows have graduated SCW since May 2012. Nearly all (26/28) of the JFEW Fellows plan to continue their science education; their planned fields of study include medicine, optometry, psychology, food chemistry, biomedical engineering, science education, and math education.

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. As

part of this joint interactive program, a laboratory course in Neurobiology was developed and included laboratory experiences both at SCW and at The Rockefeller University.

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 Pre-Med Club, the Pre-Dent 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 Physical Therapy Club hosted Dr. James Nussbaum, who spoke on the topic, "Improving Quality of Life in Patients in the US." Many of the pre-health clubs organize career panels in which Stern alumni and other invited guests provide practical advice and guidance about their respective professions. 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 2013-2014 academic year, the following students presented at SURGE meetings:

**Fall 2013
SURGE Meetings**

October 9th

Name	Research Title	Program/Location
Anna Weinstein	Stress Management Intervention for Living with Epilepsy (SMILE): Methodology, Recruitment, and Compliance	Roth Scholar
Nechama Dreyfus	Magnetic Resonance Imaging and Micro-Positron Emission Tomography Evaluation of Dietary Fat on Chagas Heart Disease.	Roth Scholar
Elana Levy	Cryo-EM of Insulin Secretion	Columbia Univ.

November 20th

Name	Research Title	Program/Location
Rena Thomas	Topological Phonon Modes and their Roles in the Instability of the Microtubules	with Dr. Prodan, Physics Dept.
Naamah Plotzker	The Combination of Rapamycin and Resveratrol in Treatments for Diseases with mTORC1 Pathway Activation	with Dr. Holz, Biology Dept.
Jennifer Herskowitz & Rachel Leah Victor	Daptomycin Interactions with TOCL Containing Membranes.	with Dr. Mintzer, Chemistry/Biochem. Dept.

December 11th

Name	Research Title	Program/Location
Aliza Goldsmith	Modification of Antibody 2556 Recognizing HIV Antigen gp41 for Radiolabeling and Radioimmunotherapy	Roth Scholar
Shira Marder	Point of Care Rapid HIV Testing in NYC Public Schools: An Analysis of Cost, Benefit and Utility	Roth Scholar
Yosefa Schoor	Discovering a New Protein in Neurons: Prr7	Roth Scholar

**Spring 2014
SURGE Meetings**

February 26th

Name	Title	Research Program or University
Sarah Mizrachi	The Role of Cancer-Derived p53 in Recruitment of the TFIID Complex to Initiate Transcription of p53 Target Genes	Roth Scholar
Ayelet Lerner	A View of the Electrostriction Effect in Gd-Doped Ceria	Brookhaven National Lab., with Dr. Frenkel, Physics Dept.
Gaby Elkaim	Scanning SQUID Microscopy	Bar-Ilan Univ.

March 26th

Name	Title	Research Program or University
Miriam Andrusier	The Effect of SIRT6 on Age-Related Pathologies and Biomarkers of Aging in Male Wild Type and Transgenic Mice	Bar-Ilan Univ.
Atara Siegel	Orthodox Jewish Women and Gynecologic Health	
Shaindy Ort	The Dissemination of Nutrition Information in a Community Pharmacy	AECOM

April 30th

Name	Title	Research Program or University
Melissa Kramer	FEZ1-Dependent Inhibition of Autophagy is Regulated by Metabotropic Glutamate Receptors	Roth Scholar
Sarah Robinson	Attention Influenced by Relevance of Stimulus	YU
Esther Kazlow	Serotonin and its Role in Gastrointestinal Diseases	Columbia University Medical Center

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 2014,

Jennifer Herskowitz and Rachel Victor (poster title: Daptomycin interactions with TOCL containing membranes), Yosefa Schoor (poster title: Prr7 is a novel regulator of the transcription factor, c-Jun), Nasim Tishbi (two posters: #1 Surface and membrane binding properties of the lipopeptide daptomycin; #2 The role of sulfation in the CCR5 chemokine receptor complex) and Aliza Goldsmith (poster title: Modification of antibody 2556 recognizing HIV protein gp41 with CHXA ligand for radiolabeling and radioimmunotherapy), at the 247th American Chemical Society National Meeting, Dallas, TX.

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 18). The *Torah U'Madda* events

included Rabbi Dr. Edward Reichman's talk, "Medical *Halakhah* Update 2014; From Printing New Organs to the Death of Ariel Sharon," Dr. Diana Chavkin's talk, "Infertility and Assisted Reproductive Technology in the Jewish Community," and Dr. Harry Ostrer's talk, "Population genetics of the Jewish people."

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, physician assistant, and nursing, while Ms. Talia Forman concentrates on careers in occupational therapy.

In the fall semester, 2012, SCW alumni, now medical students at 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 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 First (which will become 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: (a) Hofstra North Shore - LIJ School of Medicine; (b) The Medical School for International Health; (c) New York Institute of Technology, College of Osteopathic Medicine; (d) Rutgers New Jersey Medical School; (e) Sackler School of Medicine; (f) Technion American Medical School; (g) Touro College of Osteopathic Medicine; and (f) Weill Medical College of Cornell University. Other presentations included: (a) Dr. Grace Kajita, Doctors Without Borders, who spoke about major global health issues; (b) Dr. Jane Owen, DO (Obstetrics and Gynecology) and Dr. Benjamini Soffer, DO, spoke on osteopathic medicine; and (c) Dean Kerrigan, Associate Dean of Admissions of AECOM.

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 Program. 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. The other programs are Frontiers in Contemporary American Law, last year under the direction of Edward Stein, Vice-Dean of the Benjamin N. Cardozo School of Law; and Frontiers in Psychology, under the direction of Lawrence Siegel, Dean of the Ferkauf Graduate School of Psychology.

Department of Biology

Faculty: Harvey Babich, Ph.D.; Bill Bassman, M.S.; Joseph DeSantis, Ph.D.; Julia Gelman, Ph.D.; Marina Holz, Ph.D.; Jessica Linderman, Ph.D.; Brenda Loewy, Ph.D.; Jeffrey Mollin, M.Phil.; 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, and exposes them to the cutting-edge areas of biomedical research. Course offerings include Cell Biology, Developmental Biology, Ecology, Genetics, Human Anatomy, Human Biology, Human Physiology, Immunology, Medical Biochemistry, Microbiology, Molecular Biology, Neurobiology, Nutrition, Pharmacology, and Reproductive Biology.

The B.A. in Biology 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. Concentrations in Neuroscience and Cell & Molecular Biology are also offered by the Biology department; completion of a concentration is noted on the student's transcript. To accommodate the science requirements for non-science majors, the Human Biology course introduced in the Fall 2010 semester. This 4-credit course consists of both lecture and laboratory.

Exciting one-credit Journal Club courses are also offered. Prior Journal Club courses included Cellular Processes and Disease (Spring 2013), Neuroscience and Medicine (Spring 2012), and Genetics and Epigenetics (Spring 2011). Traditionally, Journal Club courses were taught by SCW graduates who are medical students in the Albert Einstein College of Medicine (AECOM). In the Fall 2014 semester, a Journal Club course geared toward pre-PT and pre-OT students was offered on the topic of Biomechanics, taught by Dr. James Nussbaum, Ph.D., P.T. In Spring 2015, a Journal Club course on Immunology and Disease geared to pre-med and pre-dent students will be offered and co-taught by Hadassa Klerman, Jennifer Deluty, and Elisa Karp.

Dr. Brenda Loewy, a faculty member of the Biology department and 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, and optometry 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 Mr. Jeffrey Mollin, a member of the Biology department, who guides students with careers goals in the fields of nursing,

physical therapy, occupational therapy, and physician assistant. Dr Alyssa Schuck, another faculty member of the Biology department, guides students participating in the Jewish Foundation for Education of Women Science Fellowship Program. Dr. Schuck was selected as the Senior Class Professor of the Year in 2013, and again in 2014.



Dr. Alyssa Schuck (right) working with summer research intern Brocha Brooks.

In the 2013-2014 academic year the Biology department hosted a series of *Torah U'Madda* presentations, including "Medical *Halakhah* Update 2014: From Printing New Organs to the Death of Ariel Sharon," by Rabbi Dr. Edward Reichman; "Infertility and Assisted Reproductive Technology in the Jewish Community," by Dr. Diana Chavkin; and "Population genetics of the Jewish people," by Dr. Harry Ostrer.

Dr. Margarita Vigodner and Dr. Marina Holz, both Associate Professors of Biology, have sky-rocketed the Biology department to new heights, facilitated by the publication of their manuscripts in prestigious scientific journals and 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 she received the LAM Foundation Pilot Award.

Dr. Vigodner's current support includes: (a) NIH, NICHD: Academic Research Enhancement Award 1R15HD067944-01A1; Second Hand Smoke as a Potential Cause of Spermatogenic Failures and Male Infertility, 9/1/2011 - 8/31/2014; and (b) NIH, NICHD: Administrative Supplements to Recover Losses Due to Hurricane Sandy, 8/31/2014 - 11/01/2015.

Dr. Holz's current funding includes: (a) American Cancer Society, 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, Identification and characterization of S6K1 targets in mammary cell proliferation, 6/01/2010 - 6/30/2016; (c) Atol Charitable Trust, The role of S6K1 in breast cancer, 6/01/2008 - 5/31/2019; (d) Atol Charitable Trust, Lab renovation and instrumentation grant, 7/01/2013 - 6/31/2014; and (e) National Cancer Center, Molecular Mechanisms of Breast Cancer, 7/01/2012 - 6/30/2014, postdoctoral fellowship for Dr. Anya Alayev.



Dr. Marina Holz (far right) with her lab team (left to right): Postdoctoral fellows Rachel Salamon and Rafael Cuesta, visiting scientist Dr. Alicja Grudowska, summer research intern Shalom Rosenbaum (Yeshiva College), postdoctoral fellows Subrata Manna and Anya Alayev, research assistant Sara Malka Berger. Dr. Alayev is a Stern College alumnus and Ms. Berger graduated from SCW in May 2013 and will be attending the graduate program in genetic counseling at Mount Sinai's Icahn School of Medicine.

Drs. Alyssa Schuck and Harvey Babich collaborate on research involving the response of human oral cancer cells to nutraceuticals, and Drs. Vigodner, Holz, Schuck, and Babich 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 those manuscripts with a publication date of 2013 and later:

- Alayev, A., Sun, Y., Snyder, R.B., Berger, S.M., Yu, L.J., and Holz, M.K., 2014, Resveratrol prevents rapamycin-induced upregulation of

autophagy and selectively induces apoptosis in TSC-2 deficient cells, *Cell Cycle*, 13: 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:

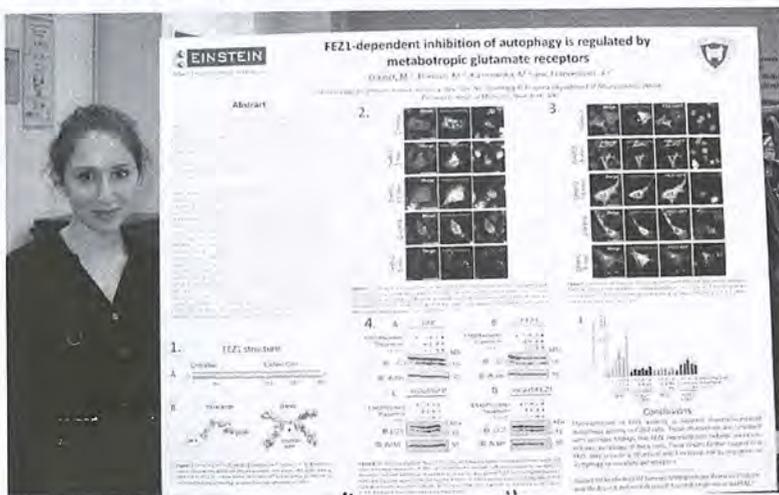
- Holz, M.K., 2014, Targeting mTOR signaling in hormone-positive diseases. Department of Pathology, Tulane University, New Orleans, LA
- Holz, M.K., 2014, Resveratrol in combination with rapamycin selectively induces apoptosis in TSC2-deficient cells - a new treatment strategy for LAM. LAM symposium, Chicago, IL
- Holz, M.K., 2014, Targeting mTOR signaling in breast cancer and lymphangioliomyomatosis. 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., Golfeiz, 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.

Off-campus research placements abound, including the Roth Scholars Program at AECOM (see "Student Research at the Albert Einstein College of Medicine") and other research internships sponsored by Yeshiva University (e.g., the YU-Bar Ilan University summer research program). For additional information, see the following sections: "Student Accomplishments," "Student Publications and Presentations," and the "Abstract Booklet."

Undergraduates majoring in Biology have achieved national recognition. Kayla Applebaum, a current SCW junior and Biology major, was named a 2014 Goldwater Scholar. She was 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. Upon graduation, Naomi continued her research as a laboratory assistant in the in-house laboratory of Dr. Holz.



Melissa Kramer (top) and Nechama Dreyfus (bottom) presenting their data at Stern College's annual undergraduate research poster session. Both students received research scholarships to work in laboratories at the Albert Einstein College of Medicine during the summer of 2013.

The Department of Biology has upgraded the infrastructure of the on-campus research laboratories. Beginning in Summer 2011, and extending into the Fall semester, the on-campus research laboratory of Dr. Holz was renovated and modernized through a \$100,000 grant from the Elias, Genevieve, and Georgiana Atol Charitable Trust. 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 Summer 2014 and continuing into Fall 2014, through a grant of \$200,000 from the Selma T. and Jacque Mitrani Foundation, renovation and modernization of the on-

campus male infertility research laboratory of Dr. Vigodner commenced. This 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.

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

To enhance the laboratory experiences in the introductory Biology courses, both for majors (Principles of Biology) and for non-majors (Human Biology), 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 introductory Biology courses meet. The camera was interfaced with a computer, allowing the microscope image to be projected on a large screen; this is 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 Summer 2010 are housed in the Sussman laboratory, a state-of-the-art laboratory utilized for advanced Biology courses.

In the 2013-2014 academic year, the Biology Club organized a series of career workshops. One workshop included a panel of SCW graduates from a variety of professions who spoke about their fields of interest. Another focused on the protocol for formulating a resume and writing a cover letter for summer internship applications. Another seminar was “Meet and Munch with SCW Biology Faculty,” in which the faculty discussed their research and courses. The Biology Club also held its annual fundraiser to raise awareness about breast cancer and to benefit Sharsheret.

Department of Chemistry and Biochemistry

Faculty: Lea Blau, Ph.D.; Allan Burger, Ph.D.; Lora Danley, M.S.; Cecily Dobin, M.S.; Donald Estes, Ph.D.; Evan Mintzer, Ph.D.; Chaya Rapp, Ph.D.; Firuzeh Victory, B.S.

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, specifically 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, Sara Snow 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) and “The Role of Tyrosine Sulfation in the dimerization of the CXCR4:SDF-1 complex” (2013, *Protein Science* 22:1025–1036). Currently our group is studying the effects of glycosylation on enzyme activity; students Elisheva Elbaz and Avital Shulman are analyzing results of molecular dynamics simulations of glycosylated protein structures such as Transpeptidase and Antiogensin-converting enzyme. Rachel Goldreich is involved in a 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.

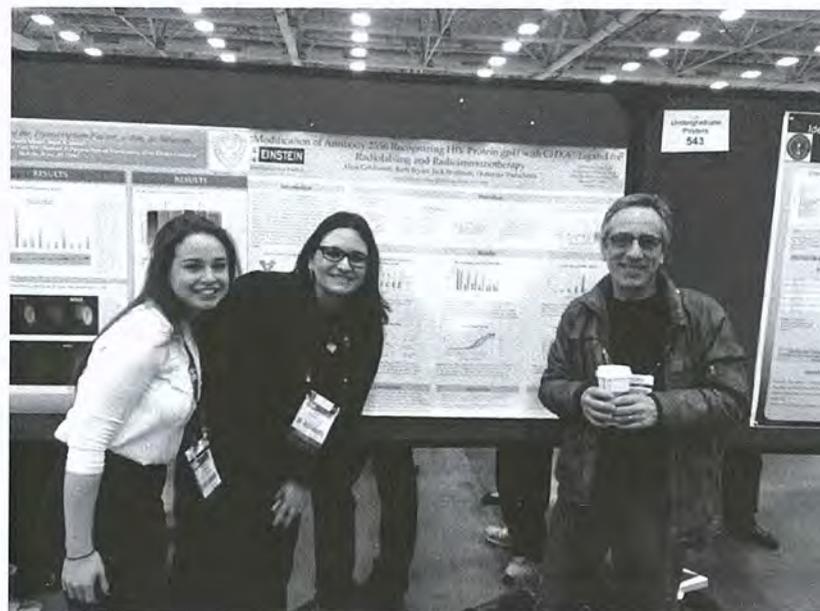
Thanks to the contributions of undergraduates Nasim Tishbi, Mushky Pinson, Jennifer Herskowitz and Rachel Leah Victor, the Mintzer Group’s studies of the mechanisms of action and resistance of the antimicrobial peptide daptomycin progressed significantly during the 2012-2013 academic year. The group has collected exciting and heretofore unreported thermodynamic data that will lead to the characterization of the peptide’s biophysical behavior as well as its interactions with model membranes that mimic both susceptible and resistant bacteria. Additionally, the activity of a novel daptomycin analog that has promising clinical potential has been established and the results published (2013, *Biochim. Biophys. Acta* 1828, 302-308). These studies are continuing with the addition of Adi Cohen and Bracha Robinson to the group of undergraduate researchers. The focus now is daptomycin activity in the presence of the membrane lipids cardiolipin and lysyl-phosphatidyl glycerol, both of which are implicated in resistance. Surface, kinetics and membrane binding properties are being investigated for comparison to the baseline parameters established in the lab over the past year. The group is also continuing its productive collaboration with Dr. Kathryn Uhrich’s group from Rutgers University. These studies involve the measurement of the stability of lipid-polymer “hybrid” macromolecules,

which represent novel species with a great many possible applications, including drug and small-interfering RNAs (siRNA) delivery. We were also able to use our methodology to generate a model for the mechanism by which such molecules are able to deliver their “freight” to the appropriate cell organelle (manuscript under revision.)

The Stern College Chemistry club, advised by Drs. Estes and Mintzer, 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.” Activities include guest lectures, including Allison Faig from Rutgers University on polymers and their use in the healthcare industry, a field trip to a cosmetic firm, attendance at a meeting of the Younger Chemists Committee of New York at the Cooper Union dedicated to the topic of flavor chemistry, a field trip with the photography club to an event describing the chemistry of photography, and an outreach program at a New York City elementary school. Furthermore, a student and her advisor attended the annual Nichols Symposium organized by the New York section of the American Chemical Society. Tie-dyeing and a magic show (directed by Mrs. Cecily Dobin, and a highlight of the year) are also included in the Club’s activities. This year a film crew from the American Chemical Society’s Washington, DC’s office visited to shoot videos of some of the demos from the magic show. Over the past decade the Club has been presented with Outstanding, Commendable, Honorable Mention, and Green Chemistry awards at ACS national meetings.



Allison Belfer at the Nichols Symposium.



Dr. Evan Mintzer with Yosefa Schoor and Aliza Goldsmith, student presenters at the undergraduate poster session of the 2014 ACS meeting in Dallas, Texas.



Aliza Goldsmith accepts an honorable mention chapter award at the undergraduate awards ceremony of the 2014 ACS meeting in Dallas.



Chemistry Club members at an outreach program at an elementary school.



Chemistry Club president Miriam Andrusier participates in the annual magic show.

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.

In recent years, the number of students enrolled in chemistry courses has increased significantly. This year, the curriculum in the organic chemistry laboratory is being revised to reflect the changes in the MCAT format. The advanced courses in Analytical Chemistry and Biochemistry incorporate experiments that are related to the instructors' research interests, allowing content to be taught in the context of current, cutting edge, and biologically relevant research. The Analytical Chemistry course emphasizes modern instrumental methods whereas in the Biochemistry course, experiments on lipid monolayers, lipid rafts, oligonucleotide melting, 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 offered. In the summers of 2013-2014, the general chemistry course, formerly given at the Wilf campus, was offered at the Beren campus.

In May 2010, six students received a bachelor degree in Biochemistry and three students were awarded a bachelor degree in Chemistry. In May 2011, nine students received a bachelor degree in Biochemistry and three students were awarded a bachelor degree in Chemistry. The department included two Biochemistry majors and two Chemistry majors in the 2012 graduating class and six Biochemistry and three Chemistry majors in the class of 2013. Recently, in May 2014, six students received a bachelor degree in 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., Associate Professor; Lea Ferreira dos Santos, Ph.D., Associate Professor; Mark Edelman, Ph.D., Clinical Assistant 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 SCW’s state of the art computational labs as well as experimental facilities in the National Laboratories and major research centers through collaborative research and education programs that the Physics department has created. All faculty members pursue an extremely active research agenda, their articles published in prestigious professional journals and their work highlighted and awarded research grants. The exposure to first-class scientific research and the atmosphere of discovery plays a major role for undergraduate students shaping their career plans.

In 2013, our department reached a significant milestone: Professors Santos and Prodan received tenure at Yeshiva University and were promoted to Associate Professors. The decision by the University to grant them tenure and promotion is a recognition of their success in advancing their research fields, strengthening YU physics programs, 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. They can choose from a variety of projects and work under the guidance of physics department members during the summers and through the year. They present their results at national and international science meetings and give seminar talks. For example, in 2014 Alyssa Lerner presented her research as a talk at the March Meeting of the American Physical Society in Denver. Physics, Physical Sciences and Pre-engineering students that are mentored by department faculty are also coauthors in refereed articles published in physics, chemistry, and materials science journals.

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 recently (2005-2006) established 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 two postdoctoral research associates and hosts visiting resident scientists per year.

Physics students benefit from an intense and challenging curriculum. In the Spring of 2014, the courses offered included General Physics (calculus based), Introductory Physics (algebra based), Electromagnetic Theory, Introduction to Modern Physics, and Intermediate Experimental Physics. The latter course had a component at Brookhaven National Laboratory, where Prof. Frenkel and his collaborator from University of New Hampshire, Prof. X. Teng, jointly organized a module in nanoscience. This effort was sponsored in part by National Science Foundation.

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

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 we place on rigorous empirical analysis, research methodology, and scientific thinking. The Research Seminar, a course taken by psychology majors 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 two specialty tracks: Developmental Psychology and Behavioral Neuroscience. The Developmental track offers a focused education to students interested in an in-depth examination of developmental research and theory throughout the lifespan. In addition to receiving a basic grounding in psychology through the core courses required of all majors, students in this track will take the Theories of Development course along with electives in each of the three major developmental stages (childhood, adolescence, and adulthood).

The Behavioral Neuroscience track 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 required of all majors, further electives in Neuroscience are required, such as Cognitive Neuroscience, Behavioral Neuroendocrinology, and a Neurobiology lecture and lab.

Students planning to apply to Ph.D. or Psy.D. programs in Psychology or to pursue careers in other health-related fields such as Physical, Occupational, or Speech Therapy, are encouraged to become actively engaged in research. Students gain invaluable experience outside the classroom 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 these cases, 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., and 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. 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 seven semesters of required course work with a minimum of 119 credits at Stern College. 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 programs in Physical Therapy with New York Medical College Graduate School of Health Sciences and 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.

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 GPA of 3.0, 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 - M.S.

Yeshiva University through an innovative agreement with the NYU Steinhardt School of Culture, Education, and Human Development, 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.

Nutrition - through a special 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.

Summer Research at the Albert Einstein College of Medicine

Every year, several of Stern College's most talented sophomores and juniors apply for research internships in the Roth Scholars Program, sponsored by the Ernst and Hedwig Roth Institute of Biomedical Science Education. This prestigious internship, hosted by YU's Albert Einstein College of Medicine (AECOM), exposes students to nine weeks each summer of intensive biomedical research. Under the guidance of AECOM's top scientists, these women participate in research projects, many at the cutting edge of medicine. For Summer 2013, five SCW women were selected for this research experience, having successfully passed the rigorous application and interview process. In addition, through the Office of the Provost, Dr. Morton Lowengrub initiated a research internship, the University Undergraduate Research Scholar. For Summer 2013, two SCW women were awarded this internship. SCW graduates, currently medical students at AECOM, have established an undergraduate research internship: the Stern-Einstein Research Connection (SERC) Scholar. The University Undergraduate Research Scholar and the SERC Scholar also performed summer research at AECOM.

Summer 2014

Roth Scholars

Jacqueline Benayoun Adi Cohen Rebecca Garber Bracha Robinson
Hadassa Holzapfel Shira Kaye Esther Kazlow

SERC Scholar

Tamar Lunzer

Summer 2013

Roth Scholars

Deena Miller Sarah Mizrachi Esther Robin
Yosefa Schoor Anna Weinstein

University Undergraduate Research Scholars

Melissa Kramer Shira Marder

SERC Scholar

Nechama Dryfus

Summer 2012

Roth Scholars

Rachel Blinick Batya Edelman Leah Gutstein Erica Hasten

University Undergraduate Research Scholars

Tova Miller Bella Wolf

SERC Scholar

Naomi Schwartz

Summer 2011

Roth Scholars

Elisa Karp Miriam Steinberger

University Undergraduate Research Scholars

Faygel Beren Jordana Schneider

SERC Scholar

Nancy Shilian

Summer 2010

Roth Scholars

Orli Haken Tsipora Huisman Hadassa Klerman Jennifer Kraut
Danielle Lent

University Undergraduate Research Scholar

Rebecca Weiss

SERC Scholar

Dina Golfeiz

Summer 2009

Roth Scholars

Fay Burekhovich Tirtza Spiegel Chava Ruderman Shoshana Zitter

University Undergraduate Research Scholar

Avital Bauman Emily Liebling

SERC Scholar

Rebecca Weiss

Summer 2008

Roth Scholars

Judith Fischer Reena Gottesman Wendy Hosinking
Batya Herzberg Sarah Ariella Hollander Tehilla Raviv

University Undergraduate Research Scholar

Ellen Dinerman

SERC Scholar
Avital Bauman

Summer 2007

Roth Scholars
Abigail Atlas Sarah Guigui Zahava Brodt
Cheryl Schonbrun Rachel Yamnik

University Undergraduate Research Scholar
Shifra Klein

SERC Scholar
Wendy Hosinking

Summer 2006

Roth Scholars
Michelle Cohen Jessica Feig Elizabeth Ravkin Louise Soussan

University Undergraduate Summer Research Scholar
Michelle Goldberg Yelena Kozirovsky

Summer 2005

Roth Scholars
Yael Barak Frida Fridman Tamar Gold Sarah Weinerman
Helen Nissim Ilana Pister Tehilla Stepansky

University Undergraduate Summer Research Scholar
Suzanne Snyder

Summer 2004

Roth Scholars
Esther Flaschner Eydie (Pesi) Porat Malkie Krupka Debbie Rybak
Reina Roth

Summer 2003

Roth Scholars
Nomi Ben-Zvi Elisheva Douglas Chaya Gopin Dina Ohevshalom

University Undergraduate Summer Research Scholar
Tova Fischer

Summer 2002

Roth Scholars
Caryn Gamss Julia (Tobi) Josovitz Meryl Sava Anna Sedletcaia

Summer 2001

Roth Scholars
Shayna Aster Elena Sedletscaia Yehudit Weinberger

University Undergraduate Summer Research Scholar
Bracha Kenigberg Hadassa Rutman Meredith Weiss

Summer 2000

Roth Scholars
Shira Rivkin Shiry Wagner

Summer 1999

Roth Scholars
Olga Dynina Rochelle Goldfisher

Summer 1998

Roth Scholars
Jennifer Feig Sivah Shifteh Malka Skiba

Summer 1997

Roth Scholar
Sarah Friedman

Summer 1996

None

Summer 1995

Roth Scholars
Caren Gottlieb Lauren Insel Azita Simoni

Summer 1994

Roth Scholars
Judy Ehrenberg Stacey Renee Rubel Brenda Wurzbarger

Summer 1993

Roth Scholars

Yaffa Cheslow Rashel Monhian Stacey Tuckman

Summer 1992

Roth Scholars

Nava Goldman Marcia R. Palace Randi Kay Sasnowitz

Summer 1991

Roth Scholars

Monica Kriger Aviva Rosenstein

Summer 1989

Roth Scholar

Heather Rush

Summer 1988

Roth Scholars

Bat Sheva Levine Tamar Silverstein

Summer 1987

Roth Scholars

Miriam Berger Aviva Kahane

Summer 1986

Roth Scholar

Deborah Bernstein

Summer 1985

Roth Scholars

Shoshana Kahn Francine Anne Ziv Elana Unger

Summer 1984

Roth Scholars

Michelle Small Susan Mandelbaum

The Anne Scheiber Fellowship Program

The Anne Scheiber Fellowship Program provides scholarship support to Stern College alumnae pursuing 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 in realizing 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

Abigail Atlas

Miriam Ausubel

Rachel Aviv

Deena Avner

Tamar Belsh

Nomi Ben-Zvi

Deena Blanchard

Yael Boyarsky

Zahava (Nilly)

Brodt

Faigy Burekhovich

Aliza Charlop

Tzipa Chaim

Esti Charlop

Elana Clark

Barrie Cohen

David Cohen

Michelle Cohen

Sarit Cohen

Jennifer Deluty

Ellen Dinerman

Batya Edelman

Esti Feder

Abigail Feldman

Tova Fischer

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

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

Ariella Nadler

Sarah Nattel

Helen Nissim

Saran Noble

Chana Gila Ovitz

Chaya Pinson

Yardanna Platt

Tehilla Raviv

Yael Raymon

Shuli Roditi-Kulak

Shira Roszler

Rachel Rubinstein

Chava Ruderman

Debbie Rybak

Esther Leah

Schoenbrum

Chana Schonbrun

Naomi Schneider

Samantha Selesny

Eliana Shaul

Necahma Mina

Shoshani

Malki Silverman

Michelle Simpser

Rose Snyder

Shani Snyder

Tirtza Spiegel

Miriam Steinberger

Tehilla Stepansky

Temima Strauss

Jessica Tugetman

Yehudit

Weinberger

Tamar Riegel

Weinberger

Amanda Weiss

Meredith Weiss

Rebecca Weiss

Bella Wolf

Sahar Zaghi

Students' Accomplishments
Academic Year 2013-2014 and Summer 2014:
Departments of Biology, Chemistry and
Biochemistry, Physics, and Psychology

Graduate/Professional Program	Specific Institutions; Number of students attending
Allopathic medical school	Albert Einstein College of Medicine (7 students); additional 10 graduates in various American medical schools (8) [including NY Medical College; Stony Brook; and New Orleans Medical School] and in medical schools in Israel (1) and in the Caribbean (1)
Osteopathic medical school	NY College of Osteopathic Medicine; LECOM (3)
Dental school	NYU Dental School; Stony Brook; UMDNJ (7)
Optometry school	SUNY (3)
Psychology (Ph.D./Psy.D.)	Ferkauf Graduate School of Psychology (2)
Physical therapy (doctorate)	Columbia; UMDNJ; Touro; SUNY Downstate; NY Medical College; Drexel (6)
Pharmacy (PharmD)	Rutgers; Touro (3)
Physician assistant	Touro (5)
Genetic counseling (M.S.)	Mt. Sinai School of Medicine; LIU (3)
Prosthetics & orthotics (M.S.)	Northwestern (1)
Occupational therapy	Touro; Kean; SUNY Downstate (4)
Nursing	Columbia; Johns Hopkins; Drexel; Adelphi; NYU; Fairleigh Dickinson; Univ. Maryland; Bon Secours Memorial College (20)
Engineering (M.S.)	Northwestern Univ. (1)
Biomedical engineering (M.S.)	Columbia Univ. (1)
Biotechnology (M.S.)	Columbia Univ. (1)
Engineering (B.S.)	Columbia Univ. (1)
Psychology (M.S.)	St. John's Univ.; CUNY John Jay College; Baruch College (Mental Health Counseling) (4)
Social work (M.S.)	Columbia Univ.; Wurzweiler; Fordham; Univ. Pittsburg (4)

Summer 2014 internships:

Yulia Addes: dental internship

Judy Alper: Department of Physics, SCW (Dr. E. Prodan)

Tamar Annenberg: Bar Ilan University (YU-BIU program)

Talia Bean: Division of Renal Diseases and Hypertension, University of Colorado

Jacqueline Benayoun: Roth Scholar, AECOM

Abigail Bergman: AECOM (Dr. Florence Marlow)

Rena Blatt: Center for Anxiety (Dr. Rosmarin)

Tikvah Bleiberg: Sloan-Kettering

Aliza Bram: Health Career Opportunity Program. NYU-Rusk (physician assistant)

Brocha Brooks: Department of Biology, SCW (Dr. A. Schuck)

Adi Cohen: Roth Scholar, AECOM

Emma Cohen: NYU Medical Center

Elisheva Elbaz: Dept. of Chemistry, SCW (Dr. C. Rapp)

Talia Felman: Bar Ilan University (YU-BIU program)

Carolyn Fine: Department of Physics, SCW (Dr. E. Prodan)

Tamar Forman: Department of Biology, YC (Dr. S. Goswami)

Rebecca Garber: AECOM

Stephanie Gold: University of Maryland Orthopedic and Rehabilitation Center

Marissa Golden: Department of Physics (YC; Dr. Buldyrev)

Rachel Goldreich: Department of Chemistry/Biochemistry (SCW, Dr. Rapp)

Tamar Golubtchik: Bar Ilan University (YU-BIU program)

Elana Granovitz: Burbank Pediatrics

Rebecca Gross: Washington University's Mallinckrodt Institute of Radiology

Jennifer Grossman: Bar Ilan University (YU-BIU program)

Chana Hecht: NYU Medical Center (Dr. Tomas Kirchhoff)

Hadassa Holzapfel: Roth Scholar, AECOM

Shoshana Javitt: Bar Ilan University (YU-BIU program)

Shaina Joyandeh: Health Career Opportunity Program, NYU-Rusk
(occupational therapy)

Sharona Kay: Bar Ilan University (YU-BIU program)

Shira Kaye: Roth Scholar, AECOM

Esther Kazlow: Roth Scholar, AECOM

Doreen Khakshour: Health Career Opportunity Program, NYU-Rusk
(physician assistant)

Rebecca Kleiner: Health Career Opportunity Program, NYU-Rusk (physical
therapy)

Melissa Kramer: Research Experience for Undergraduates (REU) Program,
College of Charleston (Grice Marine Laboratory)

Meredith Lane: Piedmont Hospital (Atlanta, GA)

Alyssa Lerner: Research Experience for Undergraduates, Program in
Miniature Robotics, University of Maryland

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

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

Tamar Lunzer: SERC Scholar, AECOM

Esther Marciano: NYU Medical Center

Rachel Mirsky: Hadassah Medical School

Ahava Muskat: Bar Ilan University (YU-BIU program)

Sarah Nagar: Department of Microbiology, NYU

Sharon Ort: AECOM (Dr. Rahmani)

Chana Ratner: Montefiore Medical Center, AECOM (Dr. Amy Fox)

Bracha Robinson: Roth Scholar, AECOM

Sarah Robinson: Bar Ilan University (YU-BIU program)

Michal Schechter: Bar Ilan University (YU-BIU program)

Shoshana Schneider: Bar Ilan University (YU-BIU program)

Eliana Schnitzer: Phoenix Baptist Hospital

Avital Shulman: Department of Chemistry/Biochemistry (SCW, Dr. Rapp)

Eliana Soskin: Greater Washington Dietetics

Allison Tawil: Department of Biology, SCW (Dr. A. Schuck)

Adina Wakschlag: Bar Ilan University (YU-BIU program)

Naomi Wakschlag: Bar Ilan University (YU-BIU program)

Tamar Wasserman: Bar Ilan University (YU-BIU program)

Alexa Wender: Lebohn Children's Hospital (Memphis, TN)

Liat Weinstock: Roth Scholar, AECOM

Natasha (nee: Rosen) Weisinger: Bar Ilan University (YU-BIU program)

Lauren Weiss: Bar Ilan University (YU-BIU program)

Samantha Wilder: Barrow Neurological Institute (Phoenix, AZ)

Jennifer Wiseman: NYU Med Ctr., Multiple Sclerosis Comprehensive Care
Center, (Dr. J. Bacon, Psychology Dept., SCW)

Leah Zerbib: Beth Israel Medical Center (Dr. Leitman)

Stephanie Zerbib: Beth Israel Medical Center (Dr. Leitman)

Students' Publications and Presentations

Scientific Journals

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

Song, J., **Fine, C.**, and Prodan, E., 2014, Effect of strong disorder in 3-dimensional chiral-symmetric topological insulators: phase diagrams and maps of the bulk invariant (*in preparation*).

Alper, J. and Emil Prodan, E., 2014, Topological phonon modes in quasi-one-dimensional mechanical systems (*in preparation*).

Korobko, R., **Lerner, A.**, Li, Y., Frenkel, A. I., and Lubomirsky I. 2014, Electric field increases local symmetry in Gd-doped ceria (*submitted to Nature*).

Torres-Herrera, E.J., **Kollmar, D.**, and Santos, L.F., 2014, Relaxation and thermalization of isolated many-body quantum systems, arXiv:1403/6481

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

Alayev, A., Sun, Y., **Snyder, R.B.**, **Berger, S.M.**, Yu, L.J., and Holz, M.K., 2014, Resveratrol prevents rapamycin-induced upregulation of autophagy and selectively induces apoptosis in TSC-2 deficient cells, *Cell Cycle*, 13: 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.

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.

Schuck, A.G., Weisburg, J.H., **Esan, H.**, **Robin, E.F.**, **Bersson, A.R.**, **Weitschner, J.R.**, **Lahasky, T.**, Zuckerbraun, H.L., and Babich, H., 2013, Cytotoxic and proapoptotic activities of gallic acid, an inducer of oxidative

stress, to human oral cancer HSC-2 cells, *Oxid. Antioxid. Med. Sci.* 2:225-229.

Rapp, C., **Snow, S.**, **Laufer, T.**, and McClendon, C., 2013, The role of tyrosine sulfation in the dimerization of the CXCR4:SDF-1 complex, *Protein Sci.* 22:1025-1036.

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.

Zhang, T., Muraih, J.K., Mintzer, E., **Tishbi, N.**, Desert, C., Silverman, J., Taylor, S., and Palmer, M., 2013. Mutual inhibition through hybrid oligomer formation of daptomycin and the semisynthetic lipopeptide antibiotic CB-182,462, *Biochim. Biophys. Acta* 1828: 302-308.

Joel, K., **Kollmar, D.** and Santos, L.F., 2013, An introduction to the spectrum, symmetries, and dynamics of spin-1/2 Heisenberg chains, *Amer. J. Phys.* 81: 450.

Maruani, D.M., **Spiegel, T.N.**, **Harris, E.N.**, **Shachter, A.S.**, **Unger, H.A.**, Herrero- González, S., and Holz, M.K., 2012, Estrogenic regulation of S6K1 expression creates a positive regulatory loop in control of breast cancer cell proliferation. *Oncogene* 31:5073-5080.

Frenkel, A.I., Vasic, R., **Dukesz, B.**, Li, D., Chen, M., Zhang, L., T. and Fujita, T., 2012, Thermal properties of nanoporous gold, *Phys. Rev. B* 85: 195419

Dinerman, J. and Santos, L.F, 2012, Manipulation of the dynamics of many-body systems via quantum control methods, *New Journal of Physics* 12: 055025.

Babich, H., **Ickow, I.M.**, Weisburg, J.H., Zuckerbraun, H.L., and Schuck, A.G., 2012, Cranberry juice extract, a mild prooxidant with cytotoxic properties independent of reactive oxygen species, *Phytother. Res.* 26:1358-1365.

Gross, S., and Freyberg, R. (2012), Margaret Washburn. In R.W. Rieber (Ed.). *The Encyclopedia of the History of Psychological Theories*. Heidelberg, Germany: Springer.

Shorr, R., and Freyberg, R. (2012), Raymond B. Cattell. In R.W. Rieber (Ed.). *The Encyclopedia of the History of Psychological Theories*. Heidelberg, Germany: Springer.

Gubin, A. and Santos, L.F., 2012, Quantum chaos: an introduction via chains of interacting spins-1/2, *Amer. J. Phys.* 80: 246.

Freyberg, R. and **Ahren, M.** (2011), Understanding fragrance preferences in adolescent girls, *J. Sensory Sci.*, 26:237-243.

Berg, N., Joel, K., Koolyk, M. and Prodan, E. (2011), Topological phonon modes in filamentary structures, *Phys. Rev. Series E*, 83: 021913

Frenkel, A.I., Yevick, A. **Cooper, C.**, and Vasic, R., 2011, Modeling the structure and composition of nanoparticles by EXAFS, *Ann. Rev. Anal. Chem.*, 4: 23-39

Marinkovic, N., Wang, Q., Barrio, L., Ehrlich, S., Khalid, S., **Cooper, C.**, and Frenkel, A.I., 2011, Combined *in situ* X-ray absorption and diffuse reflectance infrared spectroscopy: an attractive tool for catalytic investigations, *Nucl. Instr. Meth. Phys. Res. A* 649: 204-206.

Goparaju, C.M.V., Pass, H.I., Blasberg, J., **Hirsch, N.**, and Donington, J.S., 2010, Functional heterogeneity of osteopontin isoforms in non-small cell lung cancer. *J. Thorac. Oncol.*, 5:1516-1523.

Weisburg, J.H., Schuck, A.G., **Silverman, M.S., Ovits-Levy, C.G., Solodokin, L.J.**, Zuckerbraun, H.L., and Babich, H., 2010, Pomegranate extract, a prooxidant with antiproliferative and proapoptotic activities preferentially towards carcinoma cells, *Anticancer Agts. Med. Chem.*, 10:634-644.

Shrivastava, V., **Pekar, M., Grosser, E.**, Im, J. and Vigodner, M. 2010, SUMO proteins are involved in the stress response during spermatogenesis and are localized to DNA double-strand breaks in germ cells, *Reproduction*, 139:999-1010.

Shrivastava, V., **Pekar, M., Grosser, E.**, Im, J. and Vigodner, M. 2010, SUMO proteins are involved in the stress response during spermatogenesis and are localized to DNA double-strand breaks in germ cells, *Reproduction* 139:999-1010.

Yamnik, R.L. and Holz M.K., 2010, mTOR/S6K1 and MAPK/RSK signaling pathways coordinately regulate estrogen receptor alpha serine 167 phosphorylation. *FEBS Lett.* 584:124-128.

Prodan, E. and **LeVee, A.**, 2010, Tunneling transport in devices with semiconducting leads, *Phys. Rev., Series B*, 81:085307

Spiegel, T.N., Hill, K.A., and E. Warner, 2009, The attitudes of women with BRCA1 and BRCA2 mutations toward clinical breast examinations and breast self-examinations, *J. Women Hlth.* 18: 1019-1024.

Babich, H., **Akerman, N.J., Burekhovich, F.**, Zuckerbraun, H.L., and A.G. Schuck, 2009, *Gingko biloba* leaf extract induces oxidative stress in carcinoma HSC-2 cells, *Toxicol. In Vitro* 23:992-999.

Sanchez, S.I., Menard, L.D., **Bram, A.**, Kang, J.H., Small, M.W., Nuzzo, R.J., and Frenkel, A.I., 2009. The emergence of non-bulk properties in supported metal clusters: negative thermal expansion and atomic disorder in Pt nanoclusters supported on g-Al₂O₃, *J. Am. Chem. Soc.* 131 , 7040-7054.

Rapp, C., **Schonbrun, C.**, Jacobson, M.P., Kalyanaraman, C., and Huang, N, 2009, Automated site preparation in physics-based rescoring of receptor ligand complexes, *Proteins* 77:52-61.

Hathaway, F., **Burns, E.**, and Ostrer, H., 2009, Consumers' desire towards current and prospective reproductive genetic testing, *J. Genet. Couns.* 18:137-146.

Vigodner, M., Weisburg, J.H., Shrivastava, V., **Marmor, R., Fathy, J.**, and Skop, N., 2009, Differential expression patterns of SUMO proteins in HL-60 cancer cell lines support a role for sumoylation in the development of drug resistance, *Cell Tiss. Res.* 336:277-286 .

Rivera, T., Birnbaum, B., Izmirly, P., Byrne, P., Brauth, J., Katholi, M., Kim, M., **Fischer, J.**, Clancy, R., and Buyon, J., 2009, Disease progression in mothers of children enrolled in the research registry for neonatal lupus, *Ann. Rheumat. Dis.* 68a:828-835

Dukesz, F., Zilbergerts, M., and L. F. Santos, 2009, Interplay between interaction and (un)correlated disorder in one-dimensional many-particle systems: delocalization and global entanglement, *New J. Phys.* 11, 043026.

Yamnik, R.L., Digilova, A., Davis, D.C., Brodt, Z.N., Murphy, C.J., and M.K., Holz, 2009, S6 kinase I regulates estrogen receptor α in control of breast cancer cell proliferation, *J. Biol. Chem.* 284:6361-6369 .

Babich, H., **Liebling, E.J., Burger, R.F.**, Zuckerbraun, H.L., and A.G. Schuck, 2009, Choice of DMEM, formulated with or without pyruvate, plays an important role in assessing the in vitro cytotoxicity of oxidants and prooxidant nutraceuticals, *In Vitro Cell. Dev. Biol. - Animal* 45:226-233.

Durand, J.L., **Hosinking, W.**, and L.A. Jelicks, 2009, Time course of effects of inhalation anesthesia on blood glucose level in male and female C57BL/6 mice, *Horm. Metab. Res.* 41:1-3 (published on-line; DOI 10.1055/s-0028-1112114)

Guffanti, E., Kittur, N., **Brodt, Z.N.**, Polotsky, A.J., Kuokkanen, S.M., Heller, D.S., Young, S.L., Santoro, N., and U.T. Meier, 2008, Nuclear pore

complex proteins mark the implantation window in human endometrium, *J. Cell Sci.* 121:2037-2045.

Babich, H., **Gottesman, R.T., Liebling, E.J.**, and A.G. Schuck, 2008, Theaflavin-3-gallate and theaflavin-3'-gallate, polyphenols in black tea with prooxidant properties, *Basic Clin. Pharmacol. Toxicol.* 103:66-74.

Flores, R.M., Routledge, T., Seshan, V.E., Dycoco, J., Zakowski, M., **Hirth, Y.**, Rusch, V.W., 2008, The impact of lymph node station on survival in 348 patients with surgically resected malignant pleural mesothelioma: implications for revision of the American Joint Committee on Cancer staging system. *J. Thorac. Cardiovasc. Surg.* 136:605-610.

Iacobas, D., Suadicani, S., Iacobas, S., Chrisman, C., **Cohen, M.**, Spray, D., and E. Scemes, 2007, Gap junction and purinergic P2 receptor proteins as a functional unit: insights from transcriptomics. *J. Membr. Biol.* 217:83-91.

Frenkel, A.I., Ehre, D., Lyahovitskaya, V., **Kanner, L.**, Wachtel, E., and I. Lubomirsky, 2007, Origin of polarity in amorphous SrTiO₃, *Physical Rev. Lett.* 99:215502 (also in: *Virtual J. Nanoscale Sci. Technol.*, vol. 16, 2007)

Schuck, A.G., **Ausubel, M.B.**, Zuckerbraun, H.L., and Babich, H., 2007, Theaflavin- 3,3'- digallate, a component of black tea: an inducer of oxidative stress and apoptosis, *Toxicol. In Vitro* 22:598-609.

Orthmann-Murphy, J.L., Freidin, M., **Fischer, E.**, Scherer, S.S., and Abrams, C.K., 2007, Two distinct heterotypic channels mediate gap junction coupling between astrocyte and oligodendrocyte connexins, *J. Neurosci.*, 27:13949-13957.

Rapp, C.S., **Strauss, T.**, Nederveen, A.J. and G. Fuentes, 2007, Prediction of protein loop geometries in solution, *Proteins* 69:69-74.

Babich, H., **Selevan A.R.**, and **E.R. Ravkin**, 2007, Glutathione as a mediator of the *in vitro* cytotoxicity of a green tea polyphenol extract, *Toxicol. Mech. Meth.* 17:357-369.

Babich, H., Zuckerbraun, H.L., and **S.M. Weierman**, 2007, In vitro cytotoxicity of (-)-catechin gallate, a minor polyphenol in green tea, *Toxicol. Lett.*, 171:171-180.

Frenkel, A.I., Menard, L.D., Northrup, P., Rodriquez, J.A., Zypman, F., **Glasner, D.**, Gao, S.-P., Xu, H., Yang, J.C., and R.G. Nuzzo, 2007, Geometry and charge state of mixed-ligand Au₁₃ nanoclusters, *Proc. Am. Inst. Physics*, 882:749-751.

Glasner, D. and A.I. Frenkel, 2007, Geometrical characteristics of regular polyhedra: Application to EXAFS studies of nanoclusters, *Proc. Am. Inst. Physics*, 882:746-748.

Harris, T., Soussan, L., Isseroff, R., Sun, Y., Rafailovich, M.H., and A.I. Frenkel, 2007, EXAFS studies of palladium nanoparticles: Size control and hydrogenation, *Proc. Am. Inst. Physics*, 882:752-754.

Pease, D.M. Frenkel, A.I., Shanthakumar, P., Huang, T., Balasubramanian, M., Budnick, J.I., Brewe, D., **Abitbol, N.**, and O. Odom, 2007, Performance and improved design of the log spiral of revolution monochromator, *Proc. Am. Inst. Physics*, 882:902-904.

Mandell, D.J., Chorny, I., Groban, E.S., Wong, S.E., **Levine, E.**, Rapp, C.S., and M.P. Jacobson, 2007, The strengths of hydrogen bonds involving phosphorylated amino acid side chains, *J. Amer. Chem. Soc.* 129:820-827.

Ehrlich, I., Strauss, B.H., and J. Butany, 2006, Stent thrombosis following the STAR technique in a complex RCA chronic total occlusion, *Catheter Cardiovasc. Interv.*, 68:708-712.

Babich, H., **Pinsky, S.M., Muskin, E.T.**, and H.L. Zuckerbraun, 2006, *In vitro* cytotoxicity of a theaflavin mixture from black tea to malignant, immortalized, and normal cells from the human oral cavity, *Toxicol. In Vitro* 20: 677-688.

Sun, Y., Frenkel, A.I., Isseroff, R., **Shonbrun, C.**, Forman, M., Shin, K., Koga, T., White, H., Zhang, L., Zhu, Y., Rafailovich, M.H., and J. C. Sokolov, 2006, Characterization of palladium nanoparticles using X-ray reflectivity, EXAFS and electron microscopy *Langmuir, Neuroradiology* 22: 807-816.

Dow, G.S., Caridha, D., **Goldberg, M.**, Wolf, L., Koenig, M.L., Yourik, D.L., and Z. Wang, 2005, Transcriptional profiling of mefloquine-induced disruption of calcium homeostasis in neurons *in vitro*, *Genomics* 86:539-550.

Frenkel, A.I., **Nemzer, S., Pister, I., Soussan, L., Harris, T.**, Sun, Y., and M.H. Rafailovich, 2005, Size-controlled synthesis and characterization of thiol-stabilized gold nanoparticles, *J. Chem. Phys.* 123:184701.

Liu, W.C., Feldman, S.C., Schulder, M., Kalnin, A.J., Zimmerman, A., **Sinensky, R.**, 2005, The effect of tumour type and distance on activation in the motor cortex, *Neuroradiology*, 47:813-819.

Ponnusamy R., **Nissim H.A.**, and M. Barad, 2005, Systemic blockade of D2-like dopamine receptors facilitates extinction of conditioned fear in mice, *J. Learn Mem.* 12:399-406.

Jiang, T., Wang, Z., Proctor, G., **Moskowitz, S.**, Liebman, S.E., Rogers, T., Lucia, M.S., Li, J., and M. Levi, 2005, Diet induced obesity in C57BL/6J mice causes increased renal lipid accumulation and glomerulosclerosis via a sterol regulatory element binding protein-1C dependent pathway, *J. Biol. Chem.*, 280:32317-32325.

Yu, Z., Jacobson, M.P., **Josovitz, J.**, Rapp, C.S., and R.A. Friesner, 2005, First shell solvation of ion pairs: Correction of systematic errors in implicit solvent models, *J. Phys. Chem.*, part B, 108: 6643-6654.

Frenkel, A.I., **Frankel, S.C.**, and T. Liu, 2005, Structural stability of giant polyoxomolybdate molecules as probed by EXAFS, *Physica Scripta*, T115: 721-725.

Rapp, C.S. and **R.M. Pollack** (R. Frankel), 2005, Crystal packing effects on protein loops, *Proteins: Structure, Function, & Bioinformatics* 60:103-109.

Babich, H., **Gold, T.**, and **R. Gold**, 2005, Mediation of the *in vitro* cytotoxicity of green and black tea polyphenols by cobalt chloride, *Toxicol. Lett.*, 155:195-205.

Jiang, F., Zhang, Z.G., Katakowski, M., Robin, A.M., **Faber, M.**, Zhang, F., and M. Chopp, 2004, Angiogenesis induced by photodynamic therapy in normal rat brain, *Photochem. Photobiol.* 79:494-498.

Weisburg, J.H., **Weissman, D.B.**, **Sedaghat, T.** and H. Babich, 2004, *In vitro* cytotoxicity of epigallocatechin gallate (EGCG) and tea extracts to cancerous and normal cells from the human oral cavity, *Basic Clin. Pharmacol. Toxicol.* 95:191-200.

Babich, H., **Krupka, M.E.**, **Nissim, H.A.**, and H.L. Zuckerbraun, 2004, Differential *in vitro* cytotoxicity of (-)-epicatechin gallate (ECG) to cancer and normal cells from the human oral cavity, *Toxicol. In Vitro* 19:231-242.

Nehler, M.R., Coll, J.R., Hiatt, W.R., Regensteiner, J.G., Schnickel, G.T., Klenke, W.A., Strecker, P.K., Anderson, M.W., Jones, D.N., Whitehill, T.A., **Moskowitz, S.**, and W.C. Krupski, 2003, Functional outcome in a contemporary series of major lower extremity amputations, *J Vasc Surg.* 38:7-14.

Babich, H., **Sedletcaia, A.**, and **B. Kenigsberg**, 2002, *In vitro* cytotoxicity of protocatechuic acid to cultured human cells from oral tissue: involvement in oxidative stress, *Pharmacol. Toxicol.*, 91:145-253.

Babich, H., **Reisbaum, A.G.** and H.L. Zuckerbraun, 2000, *In vitro* response of human gingival epithelial S-G cells to resveratrol, *Toxicol. Lett.*, 114:143-153.

Babich, H., Zuckerbraun, H.L., **Hirsch, S.T.** and L. Blau, 1999, *In vitro* cytotoxicity of the nitric oxide donor, *S*-nitroso-*N*-acetyl-penicillamine, towards cells from human oral tissue, *Pharmacol. Toxicol.*, 84:218-225.

Zuckerbraun, H.L., Babich, H., **May, R.J.** and M.C. Sinensky, 1998, Triclosan: cytotoxicity, mode of action, and induction of apoptosis in human gingival cells *in vitro*, *Eur. J. Oral Sci.*, 106:628-636.

Babich, H., Zuckerbraun, H.L., **Ricklis, A.S.** and L. Blau, 1998, *In vitro* toxicity of sodium nitroprusside to human endothelial ECV304 cells, *Environ. Toxicol. Pharmacol.*, 5:135-144.

Davis, D.L., Gottlieb, M.B. and **J.R. Stampnitzky**, 1998, Reduced ratio of male to female births in several industrial countries: a sentinel health indicator? *JAMA* 279:1018-1023.

Babich, H., **Segall, M.A.** and K.D. Fox, 1997, The *Allium* test - a simple eucaryote genotoxicity assay, *Amer. Biol. Teach.*, 59:580-583.

Babich, H., Zuckerbraun, H.L., **Wurzburger, B.J.**, **Rubin, Y.L.**, Borenfreund, E. and L. Blau, 1996, Benzoyl peroxide cytotoxicity evaluated *in vitro* with the human keratinocyte cell line, RHEK-1, *Toxicology*, 106:187-196.

Babich, H., Zuckerbraun, H.L., **Barber, I.B.**, Babich, S.B. and E. Borenfreund, 1996, Cytotoxicity of sanguinarine chloride to cultured human cells from oral tissue, *Pharmacol. Toxicol.*, 78:397-403.

Sinensky, M.C., **Leiser, A.L.** and H. Babich, 1995, Oxidative stress aspects of the cytotoxicity of carbamide peroxide: *in vitro* studies, *Toxicol. Lett.*, 75:101-109.

Babich, H., **Wurzburger, B.J.**, **Rubin, Y.L.**, Sinensky, M.C., Borenfreund, E. and L. Blau, 1995, An *in vitro* study on the cytotoxicity of chlorhexidine digluconate to human gingival cells, *Cell Biol. Toxicol.*, 11:79-88.

Babich, H., **Palace, M.R.**, Borenfreund, E. and A. Stern, 1994, Naphthoquinone cytotoxicity to bluegill sunfish BF-2 cells, *Arch. Environ. Contam. Toxicol.*, 27:8-13.

Babich, H., **Markenson, D.F.**, Blau, L. and A. Stern, 1994, *In vitro* cytotoxicity of the chlorinated naphthoquinone, dichlone, to human endothelial ECV304 cells, *Toxicol. In Vitro*, 8:1075-1081.

Babich, H., **Palace, M.R.** and A. Stern, 1993, Oxidative stress in fish cells: *in vitro* studies, *Arch. Environ. Contam. Toxicol.*, 24:173-178.

Babich, H., Martin-Alguacil, N., **Raul, C.**, Rosenberg, D.W. and E. Borenfreund, 1991, Response of human cell cultures to cytotoxicants requiring metabolic activation, *In Alternative Methods in Toxicology*, vol. 8, Goldberg, A.M.(ed.), Mary Ann Liebert, Inc., NY, NY, pp. 263-276.

Babich, H., **Goldstein, S.H.** and E. Borenfreund, 1990, *In vitro* cyto- and genotoxicity of organomercurials to cells in culture, *Toxicol. Lett.*, 50:143-149.

Goldstein, S.H. and H. Babich, 1989, Differential effects of arsenite and arsenate to *Drosophila melanogaster* in a combined adult/developmental toxicity assay, *Bull. Environ. Contam. Toxicol.*, 44:456-460.

Blau, L., **Stern, R.B.**, and R. Bittman, 1984, The stoichiometry of A23187- and X537A- mediated calcium ion transport across lipid bilayers, *Biochim. Biophys. Acta* 778:219- 223.

Presentations at Scientific Conferences

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

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

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

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

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

Tishbi, N. and Mintzer, E., 2014, Surface and membrane binding properties of the lipopeptide daptomycin, 247th American Chemical Society National Meeting, March, Dallas, TX.

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

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

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

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

Weisburg, J.H., Schuck, A.G., **Greenbaum, R.E.**, **Golfiez, M.D.**, **Segal, J.R.**, **Weiss, R.A.**, **Liebman, E.C.**, Zuckerbraun, H.L., and Babich, H., 2013, Grape seed extract, a Mild prooxidant selectively cytotoxic to cancer cells. American Institute for Cancer Research Annual Meeting. Bethesda, MD.

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

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

Farzan, Y., and Freyberg, R., 2013, Effects of affect on prosocial behavior: A review of the literature. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

Frenkiel, L., and DiLorenzo, T., 2013, Spiritual and religious coping in cancer patients. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

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

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

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

Siegel, A., and DiLorenzo, T., 2013, Are knowledge, family and friend history of disease and perceived risk predictive of the uptake of gynecologic health recommendations in orthodox Jewish women? Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

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

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

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

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

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

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

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

Robin, E.F., **Wietschner, J.K.**, Zuckerbraun, H.L., Babich, H., Schuck, A.G., and Weisburg, H.J., 2013, Gallic acid, an inducer of apoptosis to human oral carcinoma HSC-2 cells as mediated through oxidative stress,

245th National Meeting of the American Chemical Society, New Orleans, LA.

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

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

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

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

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

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

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

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

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

Zughaft, M., **Taylor, D.J.**, and Harburger, L.L., 2012, Effects of endogenous and exogenous sex hormones on object memory and spatial

ability in young and aged women. 16th Annual N.E.U.R.O.N. Conference Program.

Zughaft, M., Taylor, D., and Harburger, L., 2012, Effects of endogenous and exogenous sex hormones on object memory and spatial ability in young and aged women. Ferkauf Graduate School of Psychology, Behavioral Sciences Student Research Conference.

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

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

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

Kollmar, D. and Santos, L. F., 2012, Invariant correlational entropy as a signature of quantum phase transitions in spin-1/2 systems", Oral presentation, March Meeting, American Physical Society, Baltimore, MD.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Joel K., Kollmar D., and Santos L. F., "Spectrum, symmetries, and dynamics of Heisenberg spin-1/2 chains", Oral presentation, March Meeting, American Physical Society 2012, Baltimore, MD.

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

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

Marinkovic, N., Wang, Q., Barrio, **Cooper, C.,** and Frenkel, A.I., 2010, Synchronous XAFS/DRIFTS Study of CO adsorption on Al₂O₃-supported Pt clusters. The First North American Core Shell Spectroscopy Conference, Denver, CO.

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

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

Donington, J.S., Goparaju, C.M.V., Blasberg, J.D., **Hirsch, N.,** Harrington, R., Pass, H.I., and Neubert, T., 2010, Extracellular mediation of divergent

impact of OPN splice variants in non-small cell lung cancer. Osteopontin Biology, FASEB Summer Research Conference, Steamboat Springs, CO..

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

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

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

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

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

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

Zitter, S., Bryk, D., Fox, A., Narlieva, M., Pan, Q., Chang, T., Cloherty, G., and Lucic, D., 2010, Swine influenza or seasonal influenza? The first clinical adaptation of an automated open platform for swine influenza. The Montefiore experience, Young Research Investigators Symposium at Montefiore Medical Center, Bronx, NY, **third place winner.**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Ruderman, E., Zack, E., and A.G. Schuck, 2009, Antitumorogenic and prooxidant activities of blueberry extract to human oral cancer cells,

Columbia University Undergraduate Research Symposium, Spring.
(abstract).

Bromberg, M.R., Patolla, A., Wang, O., Segal, R., Han W.-Q., Feldman, I., Zypman, F.R., Iqbal, 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., Mwakwingwe, A., Croken, M.M., Madrid, D., Hochman, S., and K. Kim, 2009, Genetic studies of adenosine deaminase in the rodent malaria parasites, *Plasmodium yoelii* and *Plasmodium berghei*, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

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

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

Merzel, M., Grace, M., and M. Balwani, 2009, Development and validation of a dried blood spot assay for chitotriosidase, an important biomarker for Gaucher Disease, The 237th American Chemical Society Meeting, Salt Lake City, Utah, March (abstract)

Pekar, M., Grosser, E., Goodfriend, G., Im, J. and M.Vigodner, 2009, Stress-induced response and apoptosis in germ and somatic testicular cells: involvement of SUMO proteins, Columbia University Symposium of Undergraduate Research, Spring (abstract).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Bensoussan, M., and R. Freyberg, 2006, Understanding fragrance

preferences in young women. Yeshiva University Behavioral Sciences Student Research Conference

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Estes, D.W., **Ben-Zvi, N.**, and L. Blau, 2005, The DNA melt: Composition, sequence, and thermodynamics, Gordon Research Conference on Chemistry Education Research and Practice, Connecticut College, New London, CT, June.

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

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

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

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

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

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

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

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

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

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

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

Douglas, E., Ravetch, J.V. and B. Diamond, 2004, Fc γ 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)-1 β on osteoclast formation and function in human umbilical cord blood cells, 228th National Meeting of the American Chemical Society, Philadelphia, PA

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

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

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

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

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

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

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

Vol. 18, 2014

Benayoun, J., North African Jewry: the possibility of introducing genetic screening, pp. 7-8.

Benhaghazar, R., The sounds that reach the soul, pp. 9-10.

Chase, E., Does following the Torah make us happy? pp. 11-12.

Dorfman, E., OU GMO, pp. 13-14.

Einzig, B., Leah's eyes: a contribution to her children, pp. 15-16.

Farzan, Y., Smoking in Jewish law, pp. 17-19.

Felman, T., An unexpected leader: a psychiatric analysis of King Saul, pp. 20-21.

Finkelstein, Z., The *Admoni* gene: who made the red man red? pp. 22-24.

Golfeiz, M., Chicken soup remedy: seeking truth in an "old Jewish wives' tale." pp. 25- 26.

Grossman, S., Clarifying the question of cosmetic surgery, pp. 27-28.

Kaszovitz, S., Kidney donation: it's complicated, pp. 29-30.

Miller, D., Jacob's injury: differential diagnosis of hip pathology, pp. 31-32.

Mirsky, R., Sacred hunger, pp. 33-34.

Nagar, S., Girl, boy, or somewhere in between, pp. 35.

Nathan, A., Animal experimentation: necessary evil or just evil?, pp. 36-37.

Neiman, M., On magic and medicine, pp. 38-39.

Pasik, D., The *halachic* status of an Alzheimer's patient, pp. 40-41.

Ratner, C., DNA evidence for the Bene Israel of India, pp. 42-43.

Rafael, H., The power of mindful meditation, pp. 44-46.

Rosenblatt, Kate, Seeing is believing: synesthesia at Sinai, pp. 47-48.

Schechter, M., Mythical creatures in rabbinic literature: the *adnei hasadeh* and the mud mice, pp. 49-50.

Schwartz, N., Grapes in medicine: from the Talmud until today, pp. 51-53.

Segal, J.R., Coffee: the Jewish energy drink, pp. 54-55.

Spiegelman, C., "Are you my mother?" an exploration of legal motherhood with regard to surrogacy, pp. 56-57.

Tawil, A.J., Sarah's infertility: a diagnosable case?, pp. 58-59.

Weinstock, L., Delaying ovulation for the sake of fertilization, pp. 60-61.

Wilder, S., Cancer in *Tanach*, p. 62.

Zibak, F., Awareness and prevention: the need for genetic screening in the Syrian Jewish community, 63-64.

Babich, H., Biblical and Talmudic human genetics, pp. 65-70.

Vol. 17, 2013

- Benhaghazar, R., An insight into the twin dynamic of Jacob and Esau, pp. 9-10.
- Farber, D., When timing is everything: a closer look at *bris* biology, pp. 11-12.
- Forman, D., The Jewish fasting and its relation to caffeine's effects, pp. 13-15.
- Friedman, N., The healing power of figs, pp. 16-19.
- Grossman, S., Grey hair: a stress, a disease, and a *bracha*, pp. 20-22.
- Kramer, M., Remedies in the Talmud: a second look at the medical benefits of honey, pp. 23-24.
- Massihraelian, L., Genetic screening in the Persian community: a call for change, pp. 25-28.
- Miller, S., Watch our words: the power of language on thought, pp. 29-31.
- Miller, T., Prayer and focus: a lesson in concentration, pp. 32-33.
- Pinson, C.M., The orthodox medical dilemma, pp. 34-36.
- Schechter, M., Hemophilia: the first recorded genetic disorder, pp. 37-39.
- Snyder, R., The true-blue tale of the world's favorite color, pp. 40-42.
- Wargon, S., Obesity: a big fat problem, pp. 43-45.
- Wiseman, J., Oy!besity: a weighty issue, pp. 46-48.
- Babich, H., Small fish, watermelon, cucumber, leek, onion, and garlic, pp. 49-54.

Vol. 16, 2012

- Ben David, G., Healing the unborn: fetal surgery and *halacha*, pp. 9-10.
- Benhaghazar, R., A royal disease: can a hemophiliac be circumcised? pp. 11-12.
- Bersson, A., A runner's "quick" fix: medical splenectomies in the Torah, pp. 13-14.
- Brander, A., Fate to destiny: The BRCA gene and the Jewish community, pp. 15-17.
- Edelman, B., Vampires and werewolves, pp. 18-20.
- Farber, D., Music to my ears: a scientific elucidation of *kol isha*, pp. 21-22.
- Glasner, S., Familial dysautonomia and its dental manifestations, pp. 23-25.
- Heimowitz, M., Gender assignment: a delicate matter, pp. 26-27.
- Ickow, I., Small storms, big effects, pp. 28-29.
- Lazaros, J., *Taharat hamishpacha*: its potential impact on fertility, pp. 30-33.
- Lerer, R., Surgery in Talmudic times, pp. 34-37.
- Loshinsky, A., Well-dressed or ill-dressed: the health risks and benefits of modest attire, pp. 38-40.
- Mandelbaum, M., A blessing for health, pp. 41-42.
- Marmor, H., Medical marijuana: where does Judaism stand? pp. 43-45.
- Moskowitz, N., The Davidic harp: an Aeolian awakening, pp. 46-48.
- Pasik, D., Short and sweet? Not necessarily, pp. 49-50.
- Rosenblatt, K., David versus Goliath: a rocky tale, pp. 51-56.

- Selesny, S., Salt and pepper: significant medical and biblical contributions, pp. 57-59.
- Snyder, R., Man as guardian: environmental issues in *Tanakh* and Judaism, pp. 60-62.
- Stern, C., Plague 3: more than just head lice, pp. 63-64.
- Taboraki, R., An everlasting impression: insights on tattoos and Judaism, pp. 65-66.
- Thomas, R., Beneath the surface of the heart, pp. 67-69.
- Tirschwell, Y., "Left" out of the Temple service? A *halachic* discussion on left-handedness, pp. 70-72.
- Unger, H., From Rachel to Michal: maternal mortality in *Tanach*, pp. 73-74.
- Weinberg, G., How is death defined? A focus on brain death, pp. 75-77.
- Weinstein, A., Her sister's keeper, pp. 78-80.
- Wildman, T., The Tay-Sachs mutation: an advantage for carriers? pp. 81-83.
- Wolf, B., Eli's eyes, pp. 84-85.
- Babich, H., Plagues 7 to 10, pp. 86-91.

Vol. 15, 2011

- Afpel, P., Man's place in BRCA, pp. 8-11.
- Benhaghazar, R., A wrinkle in parenthood, pp. 12-13.
- Blinick, R., Aging and longevity in science and *Tanach*, pp. 14-16.
- Cohen, S., Dreams: reality or fantasy, pp. 17-18.
- Edelman, B., Animal experimentation: a *halachic* perspective, pp. 19-21.
- Feder, E., Smoking: personal discretion or *halachic* violation? pp. 22-25.
- Goldstein, S., Bad breath in the Talmud, pp. 26-27.
- Hirsch, N., Should preconception gender selection be allowed? pp. 28-29.
- Ickow, I., An elemental and dental view of Judaic literature, pp. 30-33.
- Karp, E., Colorful chemistry in *halacha*: the mystery of *tekhelet*, pp. 34-36.
- Kohanchi, E., The Jewish stance on organ transplantation, pp. 37-39.
- Kuhr, B., Insight into Yitzchak's eyesight, pp. 40-41.
- Liebling, K.E., Lavan's real personality, pp. 42-45.
- Mandelbaum, M., Familial dysautonomia and the pursuit of genetic health, pp. 46-47.
- Margolis, S., Words to the wise, pp. 48-49.
- Meir, J., Hermaphrodite: another gender? pp. 50-51.
- Perlow, L., Defining the human species: an examination of transgenic apes in *halacha*, pp. 52-55.
- Rosenblatt, K., The resonance of Jericho, pp. 56-58.
- Silverman, M., The pomegranate: beauty and health in ancient and modern times, pp. 59-60.
- Snyder, R., *Halakhic* headaches: how much affliction is too much? pp. 61-63.
- Unger, H.A., *Maseh avot siman l'banim*: spiritual and biological parallels, pp. 64-65.
- Babich, H., Plagues 4 to 6: Wild animals, pestilence, and boils, pp. 66-70.

Vol. 14, 2010

- Ansel, A., *P'ru ur'vu* after death, pp. 7-9.
Burekhovich, F., Land flowing with honey: amazing health benefits for its people, pp. 10-13.
Deluty, J., Fatherhood after death: a biological and *halachic* analysis, pp. 14-16.
Gordon, S., Anesthesia: modern innovation with biblical origination, pp. 17-19.
Ovits Levy, C.G., Pomegranates: a holy and wholesome fruit, pp. 20-23.
Lobell, E., Clinical and *halachic* considerations involving the use of porcine whipworms to treat inflammatory bowel disease, pp. 24-28.
Perlow, L., The "warrior" gene exemplified in Esau, pp. 29-32.
Rogawski, R., The metabolic effects of *aliyah*, pp. 33-34.
Rosenblatt, K., Overnight hair whitening: a medical perspective on the Talmud, pp. 35-36.
Snyder, R., Physical and spiritual hair in Torah and Talmud: meaning and message, pp. 37-39.
Solodokin, L.J., Mandrakes: a mystical plant or legitimate herbal remedy? The chamber of secrets has been open!, pp. 40-43.
Weil, M., Continuation of species: cloning to save endangered and extinct animals, pp. 44-46.
Schiffmiller-Weinberg, A., Premarital genetic screening and its ramifications for the Jewish community, pp. 47-48.
Babich, H., The *arba minim*, pp. 49-53.

Vol. 13, 2009

- Ackerman, N.J., Infertility: a weighty matter, pp. 7-9
Adler, D., Artificial resuscitation and midwifery: from Torah times to today; pp. 10-11.
Barenboim Shulman, D., Brain plasticity and spiritual renewal: an exploration of metaphor, pp. 12-14.
Becker, K., Exercise, pp. 15-17.
Berk Retter, A., Biblical leprosy: a confusion for centuries, pp. 18-20.
Bermish, S., Modern genetics in the Bible and Talmud, pp. 21-22.
Burger, R., Onions, pp. 23-24.
Deluty, J., Talmudic medicine from head to toe, pp. 25-27.
Frankiel, I., He's got your back, pp. 28-29.
Frederick, E., Global warming: The hot topic, pp. 30-32.
Grossman, J., Teeth: taking a bite of *Tanach*, Talmud, and *halacha*, pp. 33-34.
Hollander, S.A., Jaundice in the Torah and the Talmud, pp. 35-36.
Katz, R., Oral hygiene: In the Talmud and today, pp. 37-39.
Knoll, S., Allergies in Jewish practices, pp. 40-42.
Krausz, A., Cosmetic deformities in *halachic* history, 43-44.

- Kraut, J., The most practical hand-held gadget: soap and water, pp. 45-46.
Liebling, E.J., *Tekhelet*: A chemical conundrum, pp. 47-49.
Login, J., *Tzafdinah*: A Talmudic scurvy?
Rosenblatt, K., Skin color phenomena in the Torah, pp. 53-56.
Zarnest, D., Vaccinations: An exploration of their history, development, and *halachic* ramifications, pp. 57-60.
Schuck, A., *Bircas haChammah*, pp. 61-63.
Babich, H., Biblical and Talmudic microbes, pp. 64-68.

Vol. 12, 2008

- Apfel, S., Making man in man's image. pp. 7-9.
Barenboim, D., Embryological sex determination in the Talmud and modern science, pp. 10-12.
Bier, A., The life you save could be yours... or your child's: Scientific and *halachic* approaches to mandating the HPV vaccine, pp. 13-16.
Citrin, N., To test or not to test – the BRCA genes explored, pp. 17-20.
Deluty, J., Wine: Agent of intoxication or character enhancer? pp. 21-23.
Frederick, E., Busting the myth of Jews with horns, pp. 24-27.
Hollander, S.A., King Asa's podiatric condition, pp. 28-29.
Kapetansky, D., The eleventh commandment: "Don't bite off more than you can chew," pp. 30-31.
Kaufman, S., The biblical diet: food for thought, pp. 32-33.
Kosofsky, C., The medical and ethical implications of conjoined twins, pp. 34-35.
Liebling, E.J., Extraterrestrial life in our age, pp. 36-37.
Maik, A., Smoking in *halacha*, pp. 38-39.
Merzel, M., Stem cell research: A Torah perspective, pp. 40-42.
Miller, T., The heart is timeless (as are heart attacks), pp. 43-44.
Pekar, M., Sex pre-selection, pp. 45-47.
Raviv, T., Thoughts on the ancestry of Ethiopian Jews, pp. 48-49.
Roszler, S., Religious infertility, pp. 50-51.
Stroh, A., Biblical images: Speech and hearing impediments in the Bible, pp. 52-53.
Thaler, D., The eighth month non-viable fetus: The one month difference, pp. 54-55.
Yamink, R., Vegetarianism: a guide to a perfect body, mind, and soul, pp. 56-58.
Zakharevich, C., Approaching the infinite: An intersection between mathematics and spirituality, pp. 59-62.
Babich, H., Blood, frogs, and lice, pp. 63-67.

Vol. 11, 2007

- Alkoby, J., Biblical plagues in modern times, pp. 9-10.
Amzallag, C.E., Passive euthanasia – a possible exception to *pikuach nefesh*? pp. 11-12.
Atlas, A., Torah perspectives on non-altruistic organ donation, pp. 13-14.

- Barenboim, D., Neurotransmitters, memory cells, and spiritual perception: wake up and smell the roses, pp. 15-17.
 Citrin, N., Teeth in the Talmud - a *halachic* discussion, pp. 18-20.
 Cohen, A., The 'light' of *Chazal*, pp. 21-23.
 Dinerman, C., When science contradicts Torah: how does the *halachist* respond? pp. 24-26.
 Fathy, J., Obstetrics in *Tanach*: aid in the fruition of the blessing from G-d, pp. 27-29.
 Fischer, E., How can we understand the personality of King Saul? pp. 30-31.
 Goldstein, S., Death by Jewish law: a question of brain, breath, heart, and soul, pp. 32-34.
 Katz, S., The distress of osteoporosis in the Jewish community, pp. 35-37.
 Ladaew, C., The mouth in *halacha*, pp. 38-39.
 Lipman, N., The right way for a lefty: implications of left-handedness in Jewish law, pp. 40-41.
 Marmor, R., The Bodies Exhibition: educational experience or modern day side show? pp. 42-44.
 Polin, J., Behind Leah's eyes, pp. 45-46.
 Schonbrun, C., *L'chaim* – to a long life, pp. 47-49.
 Secunda, R., How would you define *tzaraas*? pp. 50-51.
 Seleski, N., Psychoneuroimmunology: body and soul, pp. 52-53.
 Thaler, D., Siamese twins: together forever? pp. 54-56.
 Babich, H., Wine, apples, and dates, pp. 57-60.

Vol. 10, 2006

- Atlas, A., "The kidneys give advice" revisited, pp. 9-10.
 Burns, E., The Jewish women's BRCA screening dilemma, pp. 11-13.
 Cohen, A., The people of the book: on seeing, seers, and sight, pp. 14-15.
 Cohen, M., The case of the *yotzei dofen*: theoretical or actual? pp. 16-18.
 Feig, J., The Biblical pomegranate – fruit of fertility or fruit of versatility, pp. 19-23.
 Fireman, M., "Obsessed with abscesses," pp. 24-25.
 Goldberg, M., An ounce of prevention where no cure exists: preimplantation genetic diagnosis of Canavan disease and Jewish law, pp. 26-27.
 Goldstein, D., Salt: an agent of preservation or destruction? pp. 28-30.
 Goldwasser, P.C., The markings of a priest, pp. 31-32.
 Gross, Y., Have dogs been in the doghouse for too long? Recent medical studies may "shed" new light on Judaism's view of pet ownership, pp. 33-34.
 Laker, R., The mind-body connection, pp. 35-38.
 Polin, J., Modern medicine, pp. 39-40.
 Rabinowitz, A., An orthopedic analysis of Jacob's injury, pp. 41-42.
 Rechthand, R., The gnat that killed Titus, pp. 43-44.
 Soloveichik, P., The dichotomy of Torah, pp. 45-46.
 Weinerman, S., Nature's guide to self improvement, pp. 47-48.
 Weinstein, E., The source of *techeilet*: the identity of the *chilazon*, pp. 49-51.
 Babich, H., Locusts and elephants, pp. 52-56.

Volume 9: 2005

- Berley, R., The fall of a giant: a medical analysis of Goliath's demise, pp. 9-10.
 Fridman, F., Infertility and Jewish law, pp. 11-13.
 Gold, R., Oral ailments – old or new? pp. 14-16.
 Gold, T., Don't let the *tirosh* get to your *rosh*, pp. 17-19.
 Goldstein, A., An ethical debate: should scientists use data from Nazi experiments? pp. 20-22.
 Grunseid, Y., Old age – an age old aspiration, pp. 23-27.
 Kulak, S., Interface of *halacha* and genetic engineering, pp. 28-29.
 Ribalt, L., The evolution of the missing tooth, pp. 30-31.
 Weg, A., Not just chopped liver, pp. 32-34.
 Weinerman, S., Jewish genes: references to genetics in the Torah, pp. 35-37.
 Kozirovsky, Y., Bloodletting, pp. 38-42.
 Babich, H., Yonah: man against nature, pp. 43-47.

Volume 8: 2004

- Benmergui, D., A modern ailment, pp. 9-11.
 Epstein, S., Communication disorders in *Tanach* and in Judaism, pp. 12-14.
 Epstein, T., The mentally in *halacha*, pp. 15-16.
 Fridman, F., Jewish women, *taharat hamishpachah* and personal health, pp. 17-19.
 Gavrilova, T., Pain: a multi-sensory experience, pp. 23-25.
 Goldstein, A., The anthropic principle, pp. 23-25.
 Grunseid, Y., A question of the heart, pp. 26-28.
 Katzman, A., Biotechnology and the Jewish imperative to heal and to create, pp. 29-33.
 Krupka, M., Noah and the dinosaurs? Some scientific theories on the flood, pp. 34-38.
 Liebman, D., Divine dentistry, pp. 39-41.
 Lotan, D., Anthrax in Biblical Egypt, pp. 42-45.
 Moskowitz, E., Seize the moment: Occurrences of seizures in Biblical and Talmudic times, pp. 45-50.
 Nissim, H.A., The importance of sleep, pp. 51-54.
 Pressman, L., The vaccination tightrope, pp. 55-58.
 Rosen, A., The madness of King Saul, pp. 59-64.
 Shafner, A., Midwifery: advancement of present-day practice and public perspective, pp. 65-67.
 Thaler, R., Stem cells: a halachic perspective, pp. 68-71.
 Babich, H., Thirsty for Torah; thirsty for water, pp. 72-75.

Volume 7: 2003

- Schreck, D., *V'chai bahem*: The psychological health benefits of observing *mitzvos*, pp. 9-12.
 Simpson, S., Twins in Jewish history, pp. 13-17.

- Loewy, A., The admissibility of scientific evidence in *halachic* courts, pp. 18-22.
 Epstein, T., The time of death: a Torah perspective, pp. 23-26.
 Sadres, M., Who you callin' yellow? pp. 27-29.
 Heller, S., Public health in the Talmud, pp. 30-33.
 Sutton, L., Exercise: a purely physical act or a part of spiritual life, pp. 34-36.
 Radzyner, R., It's about time, pp. 37-43.
 Reinman, I., Kidney to spare? pp. 44-46.
 Babich, H., Strange, but true, pp. 47-51.

Volume 6: 2002

- Weisman, S., Embryonic stem cells in *halachah*, pp. 7-12.
 Rose, A., Weighing the sources, pp. 13-16.
 Kasnett, H., A prayer a day keeps the doctor away, pp. 17-19.
 Loewy, A., The *rimon*: a Biblical and medicinal source for longevity, pp. 20-23.
 Vogel, C., Good sun, bad sun, pp. 24-27.
 Fireman, A., The father of genetics: *Yaakov Avinu* or Gregor Mendel? pp. 28-30.
 Alpert, S., Genetic screening for the BRCA genes: *halachic* implications, pp. 31-34.
 Szigeti, A., Human cloning, a Jewish perspective, pp. 35-37.
 Glueck, A., Be fruitful and multiply: infertility in *Tanach*, pp. 38-40.
 Simpson, S., Bleeder's diseases and circumcision – science and *halacha*, pp. 41-44.
 Sedletcaia, A., The bloodsuckers of today, pp. 45-47.
 Weissman, D., Conic tubes and *techum shabbos*, pp. 48-49.
 Schwarzenberger, S., Scriptural shorties, pp. 50-52.
 Weinstein, F., *Tanach* tallies, pp. 53-55.
 Bomzer, F., The compassionate Creator, pp. 56-60.
 Aster, S., Artificial resuscitation or spiritual revival? pp. 61-65.
 Reinman, I., The holiness of the body, pp. 66-69.
 Radzyner, R., The return of the *chazir*, pp. 70-78.
 Babich, H., The *kof*, reverse evolution, and the *adnei ha-sadeh*, pp. 79-84.

Volume 5: 2001

- Rosenblatt, C., Food for thought, pp. 7-10.
 Weisman, S., Exploring *mitzvot* on the moon, pp. 11-14.
 Gold, M., Hair it goes: biblical baldies, pp. 15-17.
 Lieber, A., Siamese twins and *halacha*, pp. 18-20.
 Miodownik, M., Chicken soup: Jewish penicillin? pp. 22-23.
 Montrose, O., Anatomy of a *bracha*, pp. 24-26.
 Goldglantz, S., Smiling through the ages, pp. 27-29.
 Weinberger, Y., *Yitzhak*: a man of vision, pp. 30-32.
 English, S.A., Designer genes ... at what price? pp. 34-36.

- Wizman, S., Epilepsy in the Talmud, pp. 37-39.
 Sontag, R., Talmudic dolphins, pp. 40-42.
 Kenigsberg, B., White blood cells in the Talmud, pp. 43-46.
 Schneider, M., Man: G-d's clone, pp. 47-52.
 Radzyner, R., The interface of *halacha* and biotechnology, pp. 53-58.
 Babich, H., *Noach* and the *Tayva*: some Torah, some biology, pp. 59-65.

Volume 4: 2000

- Birman, P., The Yom Kippur effect, pp. 7-9.
 Dynina, O., Longevity in the Bible and modern science, pp. 10-13.
 Etengoff, B., Shades of "Jewish green," pp. 14-15.
 Feldman, R., Was *Moshe* left-handed? pp. 16-18.
 Gold, M., *Kesser shain tov*, pp. 19-21.
 Hochbaum, N., Were our predecessors lepers? pp. 22-23.
 Rosenfeld, L., Polydactyly in the Torah and Talmud, pp. 24-25.
 Schenker, M., Biblical bones, pp. 26-27.
 Tesser, M., The truth within, pp. 28-30.
 Babich, H., The Jewish people under the microscope, pp. 31-36.

Volume 3: 1999

- Kogan, S., The psychological ramifications of Torah education and the Jewish child, pp. 7-9.
 Babich, H., Teaching science to the Torah-observant student, pp. 10-14.
 Bodoff, T., Good things come in small packages, pp. 15-16.
 Dynina, O., Benefits of wine consumption: spiritual and scientific aspects, pp. 17-20.
 Kirschner, J., Multiple births; defining the miracle, pp. 21-22.
 Kalmar, M., Twins – or maybe not, pp. 23-24.
 Etengoff, B., Biotechnology and the resurrection, pp. 25-27.
 Reisbaum, A., Tumors in *Tanach* and Talmud, pp. 28-29.
 Goldman, Y., Is it healthy to be religious? pp. 30-33.
 Susman, A., Who wears the genes: hemophilia in the *Gemora*, pp. 34-36.

Volume 2: 1998

- Friedman, S.T., *Ya'akov* and *Esav*: identical opposites, pp. 5-10.
 Rosenblum, T.A., Garlic: "*al shum mah?*" pp. 11-15.
 Shinnar, O., Noah: a flood of great genes, pp. 16-20.
 Mermelstein, R., Teeth in the Torah, pp. 21-24.
 Stampnitzky, J., A perspective on the *Kohen's* Y chromosome, pp. 25-28.
 Jacobs, S., Heschel's concept of time as it relates to space and eternity, pp. 29-32.
 Babich, H., *V'ten tal u'matar livrachah*: thoughts on dew, pp. 33-40.

- Babich, H. and D.M. Klein, A genetic analysis of the events leading to the birth of Dinah, pp. 4-8
Brandwein, H., Did our sages write the nutrition tips that modern research has uncovered? pp. 9-11.
Katz, A.L., The natural choice, pp. 12-14.
Schapiro, S., Yeast and the *yeizer hara*: the biology beneath the symbolism, pp. 15-17.
Segall, M., *Eitz chaim*, pp. 18-21.
Suss, J., Fish and Judaism, pp. 22-25.



Stern College for Women Yeshiva University

Department of Biology
Department of Chemistry & Biochemistry
Department of Physics
Department of Psychology

Co-editors:

Chana Ratner, Department of Biology
Jacqueline Benayoun, Department of Chemistry and Biochemistry
Alyssa Lerner, Department of Physics
Naomi Wakschlag, Department of Psychology

Differential Antimicrobial Effects of Apple Polyphenol Extract on *Staphylococcus aureus* and *Escherichia coli*

Gabrielle A. Bayliss, Noor N. Taied, Tova Plaut, Kate Shapiro

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

Research on the antimicrobial effects of fruits has benefitted from the findings that many dietary fruit juices and extracts have antimicrobial and anticarcinogenic properties. Prior research in this laboratory (Sabbah *et al.*, 2012) has shown that polyphenol-rich fruit extracts, such as those from bilberry, have cytotoxic effects against rat glioma C6 cancer cells. As recent findings in this laboratory have shown the selective cytotoxicity of an apple polyphenol-rich extract (APE) to cancer, rather than to normal, human cells, this research was extended to elucidate the comparative response of representative Gram positive and Gram negative bacteria to APE.

The bacteria selected were *Staphylococcus aureus*, a Gram (+) bacterium, and *Escherichia coli*, a Gram (-) bacterium. These particular organisms were selected as there are clinical varieties that cause various pathologies and that have developed resistance to conventional antibiotics. Therefore, alternative therapeutic measures are needed, and fruit extracts may offer such an alternative. Using the Kirby-Bauer test, which is based upon the diffusion of the test agent from a paper disc into the surrounding agar, the antimicrobial nature of APE was evaluated after 24- and 48-hr treatment periods. If the test agent is cytotoxic or cytostatic, circular areas around the discs, called zones of clearance, are observed. In this assay, sterile paper discs impregnated with varying concentrations of APE were placed on Mueller Hinton agar plates inoculated with the bacteria and incubated at 28° C for *S. aureus*, and 37° C for *E. coli*. Progressively increasing the concentration of APE from 200 to 2,000 µg/mL yielded no observable zones of clearance for either organism. Zones of inhibition, however, were observed for positive control discs impregnated with streptomycin.

The antimicrobial potential of APE to *S. aureus* and *E. coli* was also evaluated by incubating the organisms in tryptic soy broth (TSB) amended with varying concentrations of APE and measuring the rate of bacterial growth over time by recording absorbance values, at 550 nm, with a microtiter plate spectrophotometer. Prior to testing the antimicrobial effect of APE, the optimal density of bacteria to start the experiment was established as follows. *S. aureus* and *E. coli* were incubated for 24 hours in 10 mL TSB at 28° C for *S. aureus* and at 37° C for *E. coli*. From this stock, 1:5, 1:10, and, 1:20 dilutions of bacteria suspended in TSB were prepared in a 96-well plate. Bacteria were incubated at room temperature on a microtiter plate shaker, and growth was measured at 1-hr intervals over a 5-hr period to determine the optimal dilution of bacteria to be used experimentally with

APE. A dilution of 1:10 yielded the optimal bacterial density for the experiment, with both organisms entering the logarithmic phase, characterized by cell doubling at regular time intervals, within the first 2 hours of incubation.

To test the antimicrobial effect of APE, a 1:10 dilution of bacterial suspension was prepared for each organism, in addition to a 500 µg/µl stock solution of APE dissolved in DMSO. The bacterial suspensions were amended with 0, 500, or 1000 µg/mL APE. Four rows, *i.e.* 32 wells, were used for each concentration of extract. Bacterial growth was measured at 1-hr intervals over a 5-hr period, with the bacteria incubated at room temperature on a microtiter plate shaker. Increases in absorbance were indicative of growth, whereas the lack of increased absorbance was indicative of growth inhibition.

For both concentrations of APE, preliminary data suggested that APE had a slightly stimulatory effect on *E. coli* but a considerable inhibitory effect on *S. aureus*. As expected, control wells containing only bacterial suspension (0 µg/mL APE) showed increasing absorbance in a logarithmic fashion (Fig. 1). Additional studies are needed, as a solvent more suitable than DMSO is required to solubilize the APE, as at times, the nutraceutical appeared to come out of solution. Additional experiments are needed to optimize the experimental conditions.

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

Talia Bean¹, Moshe Levi², Yuhuan Luo², Xiaoxin Wang²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Medicine, Division of Renal Diseases and Hypertension, University of Colorado AMC, Aurora, CO

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

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

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

Study of the mice models' kidneys revealed that in mice with untreated obesity and diabetes, inflammation, oxidative stress, and lipids are increased in the kidney, resulting in kidney fibrosis. Lipid accumulation in the kidney is shown in Fig. 1 with Coherent Anti-Stokes Raman Scattering (CARS) Microscopy. Treatment with the TGR5 agonist INT-777 decreased urinary albumin excretion and prevented inflammation, oxidative stress, lipid accumulation, and fibrosis. The effect the treatment had on collagen IV, a protein associated with fibrosis, can be seen in Figure 2. Treatment with

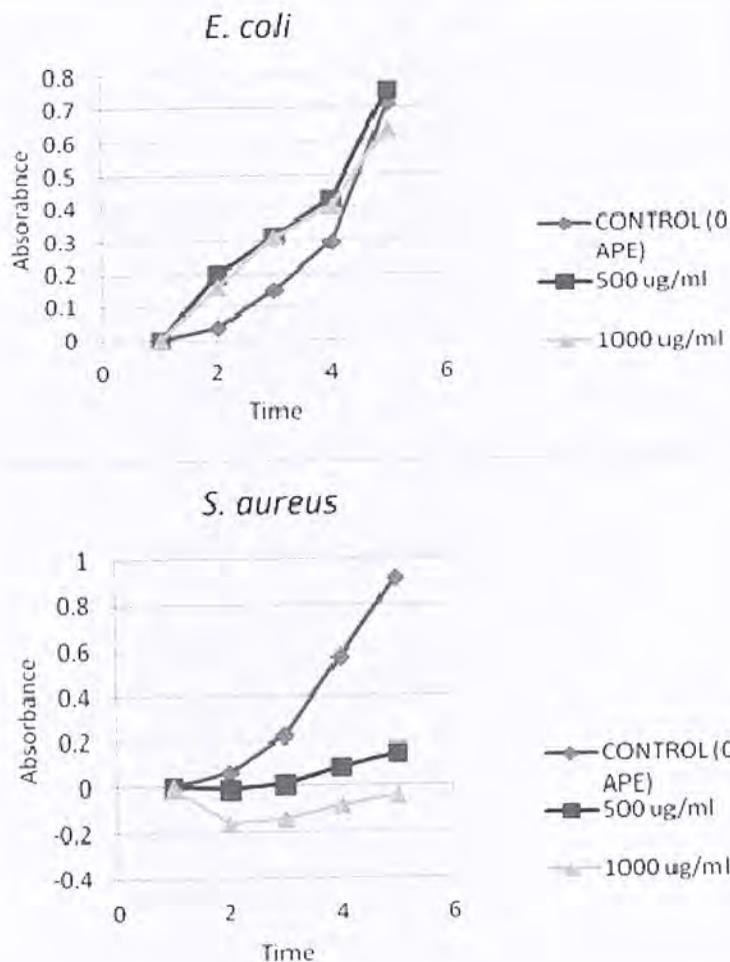


Figure 1. Antimicrobial effect of apple polyphenol extract on *E. coli* and *S. aureus* over a 5-hr incubation period.

Sabbah, L., Ben-David, G.S., Cohen, B.S., and Ravkin, E.R., 2012, Bilberry extract, a prooxidant nutraceutical with toxicity towards glioma C6 cancer cells, *Women in Science*, 5: 20-21 (abstract).

TGR5 agonist INT-777 led to increased AMPK, SIRT1, PGC-1 α , SIRT3, and ERR α protein abundance, also increasing mitochondrial biogenesis, energy expenditure, fatty acid oxidation, and mitochondrial antioxidant generation. TGR5 activation significantly reduced renal complications in diabetes and obesity, while increasing metabolic function. Due to TGR5's far reaching effect, it is an important progression in the prevention and treatment of renal disease in patients with obesity and diabetes.



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



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

[1] Ix JH, Sharma K. Mechanisms linking obesity, chronic kidney disease, and fatty liver disease: the roles of fetuin-A, adiponectin, and AMPK. *J Am Soc Nephrol* 2010, 21: 406.

[2] Finkelstein, E. A., Khavjou, O. A., Thompson, H., Trogdon, J. G., Pan, L. P., Sherry, B., & Dietz, W. Obesity and severe obesity forecasts through 2030. *Am J Prev Med* 2012, 42: 563.

Allelic Diversity of IFNAR-1 in African Patients with Malaria

Jacqueline Benayoun¹, Lucas R. Cusumano², Seungjin Ryu², Catherine Manix Feintuch², Daouda Ndiaye³, Esther Gondwe³, Karl Seydel³, Terrie Taylor³, Yousin Suh², Johanna P. Daily²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Microbiology and Immunology, Albert Einstein College of Medicine, Bronx, NY; ³Blantyre Malaria Project, Blantyre, Malawi

Malaria is a serious and sometimes fatal disease that caused 207 million clinical episodes and 627,000 deaths in 2012 alone (World Health Organization). Genetic predispositions can modulate the risk for severe malaria. Prior studies have found the association of mutations within the Type I Interferon Receptor (IFNAR1) and disease outcomes in *Plasmodium falciparum* malaria. To further explore the role of mutations in IFNAR1 we carried out an in-depth Single Nucleotide Polymorphism (n=21 SNPs) analysis at the IFNAR1 locus. We examined genomic DNA from children with cerebral malaria from Malawi and tested associations with disease outcomes. In addition we examined the IFNAR1 allelic diversity between West Africa (Senegal) and East Africa (Malawi).

Type I IFNs are involved in host response to malaria. Type I IFNs prime macrophage pro-inflammatory responses, enhance intracellular killing, dendritic cell maturation and T helper 1 cell responses; and promote lymphocyte activity. Type I IFN has been associated with modulating malaria infection outcomes in the animal model of cerebral malaria and in human malarial disease.

Type I IFN receptor (IFNAR1) polymorphisms are associated with disease outcomes in malaria. This will be tested through an association study of IFNAR1 alleles in patients with mild versus severe malaria.

Genomic DNA was extracted from dry blood spots of African Patients using a DNeasy extraction kit. The samples were quantified by nanodrop and amplified using PCR. Gel electrophoresis was run to confirm the presence of the DNA. Then, Iplex mass- spectrophotometry was performed to determine the alleles present in the African cohorts in 21 SNPs. Finally, a Typer program was used to generate the patient spectra and allele call rate.

After testing 21 SNPs, a 94% call rate from 20 SNPs was achieved. Out of the 20 primers that worked, 7 primers were monomorphic. From the remaining 13 primers, 4 primers showed no significant differences between the acute and mild cohorts, and 3 were statistically significant.

Significant differences are present in the IFNAR1 locus between severe and mild malaria cohort. Further studies should be repeated using a mild malaria cohort from Malawi to match population background. Additionally, the functional significance of this allelic diversity must be defined and linked to additional disease outcome (such as anemia and survival rate).

Acknowledgements:

- The Daily Lab, Albert Einstein College of Medicine
- David Reynolds and Kevin Lau, Albert Einstein College of Medicine Genomics Core

The Effects of Parents' Stress on their Children's Therapy

Rena Blatt¹, Sarah Rossen¹, Hannah Schacter Gampel²

¹Department of Psychology, Stern College for Women, Yeshiva University, New York, NY; ²Ferkauf Psychology Graduate School, Yeshiva University, Bronx, NY

The current literature provides substantial evidence that parental involvement affects a child's therapy outcome. The literature also supports the notion that level of parental stress affects a child's development, as well as his or her capacity to comply with the demands of daily functioning, and his or her ability to cope with challenging life events. However, the effect of parental stress on child therapy outcome has not yet been examined in the literature.

This study has potential to substantiate the therapeutic alliance and how it may directly affect a child's successful therapeutic outcome. The study will also explore if there is a relationship between the therapeutic alliance, a studied predictor of therapeutic outcome, and parenting stress. In light of the environmental difficulties families may face, specifically families seen for therapy in community clinics settings such as the Parnes Clinic, this is an important and valuable area of study that has not yet been sufficiently explored in the current literature. With this information, treatment plans and course of treatment can be developed to better help the child and his/her family.

The data will be analyzed primarily using descriptive statistics and in multiple regression analyses. One regression analysis will be performed to determine the relationship between levels of parental stress and child therapy outcome. Another regression analysis will be performed to ascertain the relationship between therapeutic alliance and child therapy outcome. The relationship between these three variables will also be explored. Additionally, the study will investigate whether the therapeutic relationship has a larger effect on outcome for children with externalizing symptoms or children with internalizing complaints. Moving forward, data will be collected in six-month intervals to aid Parnes Clinic student clinicians in establishing treatment plans, monitoring the child's progress, and modifying treatment goals in therapy. Thirty five children ages 4- 17 participated in the study. Each child was given numerous measures such as YSR, Youth Self Report, CBCL, Child Behavior Checklist, BRIA, Bell Relationship Inventory for Adolescents and SIPA, Stress Index for Parents of Adolescents. The measures were used to determine and test adolescents stress levels and how adolescent's therapy was affective. Preliminary results support our hypothesis of parental stress affecting adolescent's therapy outcome.

The Effect of Apple Extract on Cancer Cells of the Human Oral Cavity

Brocha Brooks, Allison J. Tawil, Oria Bitton, Rebecca Garber, Yael Herskovitz, Moran Yazdani, Adina Wakschlag, Farha Zibak, Alyssa G. Schuck

Stern College for Women, Yeshiva University, New York, NY

Apple extract (AE) is a complex mixture containing both nutritive and non-nutritive components. Some of the non-nutritive components, termed nutraceuticals, are found in various fruits and vegetables, and have been shown to provide health benefits, such as the prevention of cardiac disease, neuropathologies, and chemoprevention. Since oral squamous cell carcinoma is one of the most common head and neck cancers, the goal of the present study was, first, to demonstrate the selective toxicity of an AE (*Malus pumila mill*) to human oral carcinoma HSC-2 cells compared to normal gingival HF-1 and GN46 fibroblasts, and second, to determine whether the mechanism of cytotoxicity toward cancer cells was by AE's induction of oxidative stress, leading to apoptosis (programmed cell death). Such evidence would corroborate other studies that have pointed to the consumption of a healthy diet in maintaining overall health.

Human oral carcinoma HSC-2 cells were more sensitive than normal gingival HF-1 and GN46 fibroblasts to a 24-hr exposure to AE, as assessed by the neutral red cytotoxicity assay. Midpoint cytotoxicity (NR₅₀) values were calculated as 275 µg/ml AE for the HSC-2 cells, and >500 µg/ml for the normal fibroblasts. Toxicity was also demonstrated by flow cytometry, using the Guava EasyCyte Miniflow Cytometer, to calculate the percentage of live, apoptotic, and dead cells (Fig. 1).

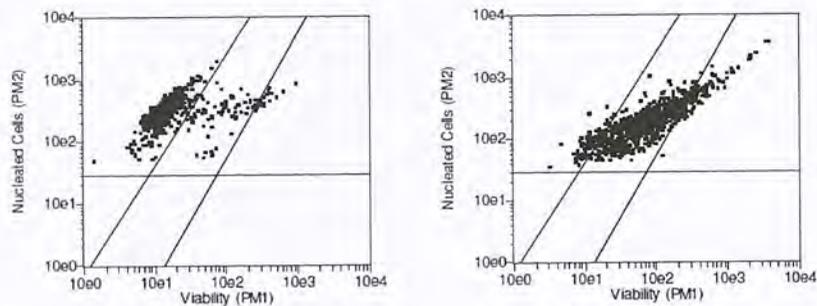


Figure 1. Representative FACS profiles of viable, apoptotic, and non-viable HSC-2 cells after a 24-hr treatment with AE. (A) untreated control; (B) 350 µg/ml AE. Viable cells are located on the left side of each panel; apoptotic cells between the two lines; and dead cells on the right side of the panel.

Apoptotic cell death was induced by AE treatment of HSC-2 cells, as demonstrated by flow cytometry (Fig. 1), photomicroscopy (Fig. 2), and western blot analysis (Fig. 3). Flow cytometric analysis utilized the Guava Viacount reagent to distinguish between viable cells, nonviable, and apoptotic cells, based on cell size, nucleation, and DNA fragmentation. Photomicroscopic analysis also revealed cell morphologies consistent with apoptotic cell death, namely, cytoplasmic and nuclear condensation as well as blebbing (Fig. 2C). Protein markers of apoptotic cell death, detectable by immunoblotting, include cleavage, and thereby activation, of caspase-3, one of the main activators of apoptosis, as well as cleavage, and thereby inactivation, of the DNA-repair enzyme, poly(ADP-ribose) polymerase (PARP) (Fig. 3).



Figure 2. Morphologies of HSC-2 carcinoma cells, untreated and in the presence of AE, after a 24-hr exposure. (A) untreated control; (B) treated with 250 µg/ml AE; (C) treated with 300 µg/ml AE. Giemsa stain; original magnification, X320.

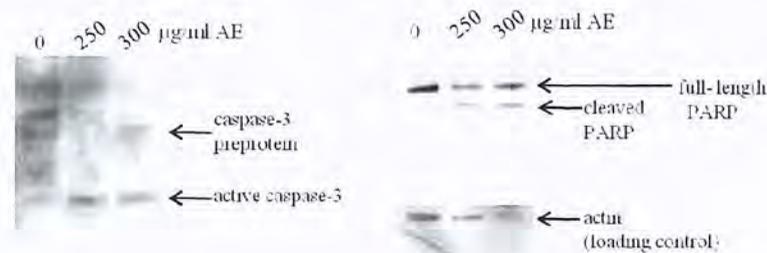


Figure 3. Western blot analysis of apoptotic marker proteins. (A) immunoblot of control and treated HSC-2 cell lysates, using anti-caspase-3 antibodies (B) using anti-PARP antibodies and anti-actin antibodies as the loading control.

Oxidative stress has been implicated as an inducer of apoptosis, and prooxidant properties have been attributed to several other polyphenolic nutraceuticals (e.g. theaflavin-3-gallate, gallic acid). To determine whether AE displays prooxidant properties, cytotoxicity assays were performed in the presence of divalent cobalt, catalase, and pyruvate, all of which are scavengers of H₂O₂. The 24-hr cytotoxic potency of AE to the HSC-2 cells was greatly lessened upon exposure to AE in the presence of cobalt (NR₅₀ >500 µg/ml), however, it was unaffected in the presence of catalase and pyruvate. As these results were inconclusive, further experiments are required to determine the mode of toxicity of AE toward oral carcinoma HSC-2 cells.

Anti-Cancer Activity of a p300 Inhibitor and Trimeric in Head and Neck Squamous Cell Carcinoma Cells

Emily Chase¹ and Quintin Pan²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Otolaryngology-Head and Neck Surgery, The Ohio State University Wexner Medical Center, Columbus, OH

Head and neck squamous cell carcinoma (HNSCC) is the sixth most common cancer worldwide. In this study, we determined the anti-cancer activity of two novel drugs, p300 inhibitor and trimeric, in HNSCC cells. p300 is a transcriptional co-activator and plays a key role in integrating a cadre of signal transduction pathways. The p300 inhibitor used in this study blocks histone acetyltransferase activity of p300 to prevent p300-directed acetylation of target proteins. Trimeric is a novel formulation that combines the active anti-cancer components of three natural products. The goal of the study was to determine the efficacy of a p300 inhibitor and trimeric, as single-agent or in combination with cisplatin, a standard of care chemotherapeutic, to inhibit the viability of HNSCC.

In our experiment, HPV-negative CAL27 HNSCC cells were treated vehicle or single-agent cisplatin, p300 inhibitor or trimeric. The MTS assay, an *in vitro* assay to quantitate the metabolic activity of cells, was performed to assess cell viability after drug treatment. Our results show that single-agent cisplatin, p300 inhibitor and trimeric reduced the viability of CAL27 cells compared to vehicle (Figure 1). In addition, we examined whether p300 inhibitor or trimeric will synergize with cisplatin to optimally ablate HNSCC cells. The combination regimen of the p300 inhibitor and cisplatin or trimeric and cisplatin resulted in lower cell viability than with cisplatin treatment alone (Figure 2). However, the addition of cisplatin did not show a conclusive advantage over the p300 inhibitor or trimeric monotherapy (Figure 2). Our work provides initial evidence that a p300 inhibitor and trimeric are active drugs to reduce the viability of HNSCC cells. The lack of synergy observed with the combination regimen suggests that a distinct cell population may be resistant to cisplatin, p300 inhibitor and trimeric.

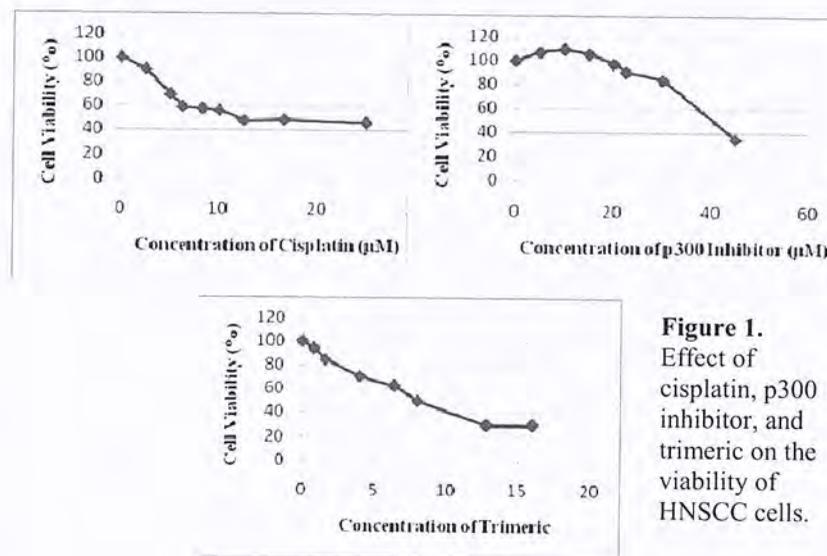


Figure 1. Effect of cisplatin, p300 inhibitor, and trimeric on the viability of HNSCC cells.

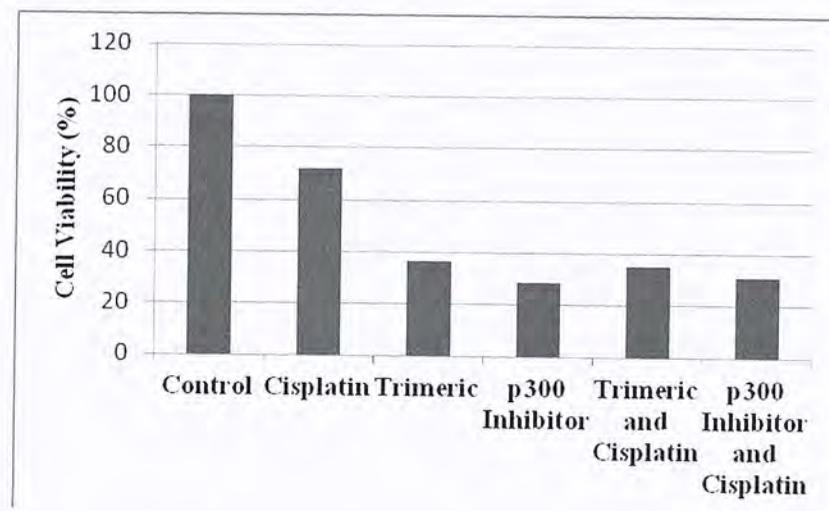


Figure 2. Effect of combination regimens on the viability of HNSCC cells

Characterization of *Plasmodium vivax* ENT1 Single Nucleotide Polymorphisms

Adi Cohen¹, Roman Deniskin², Myles Akabas²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Physiology and Biophysics, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY

Malaria is a life threatening disease caused by parasitic protists of the genus *Plasmodium*. Every year, ~3 billion people are at risk of getting malaria and about half a million people die from malarial infections. Two *Plasmodium* species contribute to >80% of the disease mortality and morbidity: *Plasmodium falciparum* and *vivax*. Rapid antimalarial drug resistance has developed over the past two decades, which underscores the importance of identifying new drug scaffolds with unique targets. Since *Plasmodium* spp. are purine auxotrophic organisms and require the salvage of purines from their host, the parasite purine salvage pathway is a great target for drug development. In *Plasmodium*, the import of purines into the parasite is mediated by equilibrative nucleoside transporters (ENTs). In *P. falciparum*, PfENT1 is the principal purine transporter. While much is known about PfENT1, little is known about PvENT1 and the three single nucleotide polymorphisms (SNPs: M99I/Q367K, N329S) of the gene.

In this body of work, we used purine auxotrophic *Saccharomyces cerevisiae* yeast cells to heterologously express wild-type protein and the PvENT1 SNPs. We evaluated the ability of these strains to take up purine and grow on either solid media or in liquid culture. All strains grew equally in media where adenine was the sole purine source (EC_{50} : 20-40 μ M). However, in the presence of adenosine, the N329S mutant failed to proliferate; the remaining SNPs had similar EC_{50} values (~0.3-1 mM). Next we evaluated whether the SNPs altered the binding profile of various purine substrates by measuring the uptake of [³H]adenosine in the presence of increasing concentrations of inosine and hypoxanthine (HX). EC_{50} values for the inhibition of radiolabel was the same for all the SNPs (EC_{50} inosine: ~6-15 μ M; EC_{50} HX: ~0.6-1 mM). We also demonstrated that adenosine uptake is pH dependent: uptake was higher in acidic pH compared to more alkaline conditions. We are currently characterizing the N329S SNP as it is the only mutant that has inconsistent results across the different yeast assays.

Acknowledgements

- Albert Einstein College of Medicine Summer Undergraduate Research Program
- The Akabas lab members: Dr. Myles Akabas, Roman Deniskin, I.J. Frame, and Avish Arora

The Role of Peptide- and Peptidomimetic-Based Cathepsin-C Inhibitors on Inhibition of Necrosis

Talia Felman¹, Shira Hirsch², Professor Amnon Albeck²

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

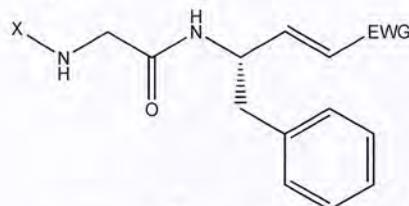
Necrosis is a type of cell death that occurs as a result of trauma or internal disturbances in the cell. It often accompanies neurodegenerative disorders, heart disease, neuronal ischemia and toxicity, muscular dystrophy, diabetes, and infections. Unlike apoptosis, necrosis is considered non-programmed, non-controlled, and harmful to the organism. Proteases, such as elastase, are thought to play an essential role in the necrotic process, as they are involved in protein degradation and signaling related to cell death.

Research done by Prof. Ilana Natan of Ben Gurion University and Prof. Amnon Albeck has confirmed that elastase-like proteolytic activity is an active and critical element of the necrotic process. Thus, inhibition of this enzyme can impede necrosis. The focus of the current research was inhibition of the enzyme cathepsin-C, which activates elastase thereby prompting necrosis.

Six compounds were designed as potential inhibitors of the enzyme cathepsin-C and synthesized (Figures 1 and 2). The structures of the compounds have either peptide or peptidomimetic basis. They mimic the biological functioning of the enzyme's usual substrate so that the enzyme will bind to the inhibitor instead of to its substrate. Of the six inhibitors synthesized in this study, two consist of the sequence glycine - phenylalanine but differ in the reactive functional group on the C-terminus, which can be either a vinyl nitrile or vinyl sulfone (Figure 1); abbreviated GCN and GSO₂. Two inhibitors consists of the unnatural amino acid sarcosine and phenylalanine, and they also differ in their C terminus, which is either vinyl nitrile, designated SCN, or vinyl sulfone, designated SSO₂ (Figure 1). The last two inhibitors consist of reduced glycine and phenylalanine (replacing the native amide bond by aminomethylene functionality) and contain either the vinyl nitrile or vinyl sulfone C-terminus (RACN; reductive amination CN and RASO₂; reductive amination SO₂) (Figure 2).

EWG = CN, SO₂CH₃

Fig. 1



EWG = CN, SO₂CH₃

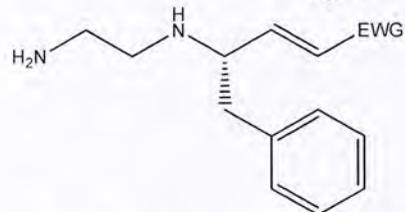


Fig. 2

Figure 1. The structure of GCN, GSO₂ (X=H); **Figure 2.** The structure of RACN and RASO₂, and SCN and SSO₂ (X=CH₃)

In order to investigate the inhibitors' abilities to prevent necrosis, they were tested on three cell lines. After growing each cell line and incubating them with the inhibitors, KCN was used to induce necrosis. KCN triggers histotoxic hypoxia through the binding of CN⁻ to the iron ion in cytochrome C oxidase, a complex in the electron transport chain of mitochondria. Thus, aerobic ATP production is disturbed and the cell undergoes necrosis. Following incubation with both inhibitors and KCN, the levels of LDH, a cytoplasmic enzyme released into the medium as a result of necrosis, were recorded in order to determine the number of ruptured cells. To measure LDH levels in the medium, NADH, a co-substrate of LDH, was added and the product of the reaction was analyzed using spectrophotometry at a wavelength of 340 nm.

The first cells that were studied were PC-12 cells, cancerous cells taken from pheochromocytoma of rat adrenal medulla. The experiment performed on the PC-12 cells consisted of three stages. The first was to test varied concentrations of KCN in order to determine which concentration would most effectively induce necrosis. Concentrations of 20, 15, 10, and 5 mM, and control (0 mM) were tested, and 10 mM was determined to be most appropriate. The second stage aimed to ensure that the synthesized materials would not be toxic to the cells. By incubating the cells with the inhibitors, it was confirmed that the cells do not undergo necrosis from the inhibitors or by themselves, but rather, only as a result of the KCN. The last stage included incubating the cells with both KCN and the inhibitors at concentration of 100 μM in order to determine the protective effect of the inhibitors. After completing the experiment and analyzing the results, certain inhibitors proved to be more effective than others (Figure 3). RACN was

found to be most protective, decreasing the rate of necrotic cell death by 19%. SSO₂ protected the cells at a level of 14%. GCN protected the cells at a level of 12%.

The second cell line tested was L-6, a less malignant, less aggressively cancerous cell line taken from the skeletal muscle of rats. Using KCN to induce necrosis was not effective and, therefore, the testing of L-6 cells was stopped after the first stage.

The last cell line investigated were the non-cancerous muscle cells of mice in the lab of Prof. Asher Shainberg at Bar Ilan University that were exposed to hypoxic conditions. Due to the non-cancerous nature of these cells, the inhibitors proved to be most protective in this cell line. While not all the inhibitors were equally protective, several stood out as successful. The percent protection relative to untreated cells was as follows: GCN 28%; SSO₂ 67%; RACN 63%, RASO₂ 33% (Figure 4).

In conclusion, this research involved the design and synthesis of six potential cathepsin C inhibitors and evaluation of their protective effect against necrosis. The synthesized inhibitors proved to be effective to varying degrees in different cell lines. The results support the hypothesis of the involvement of the proteolytic enzyme cathepsin-C in necrosis.

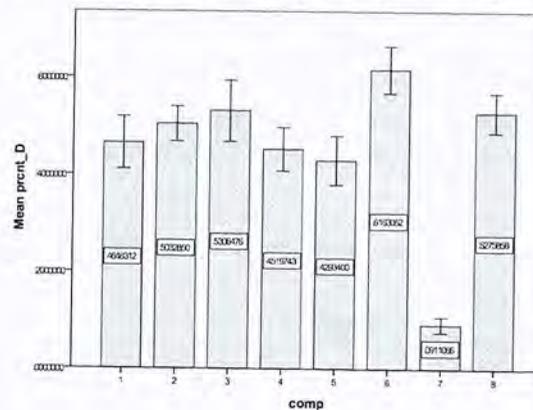


Figure 3. The protective effect of cathepsin C inhibitors against KCN-induced necrosis in PC-12 cells. The inhibitors (left to right): GCN, GSO₂, SCN, SSO₂, RACN, RASO₂, control (no KCN), KCN.

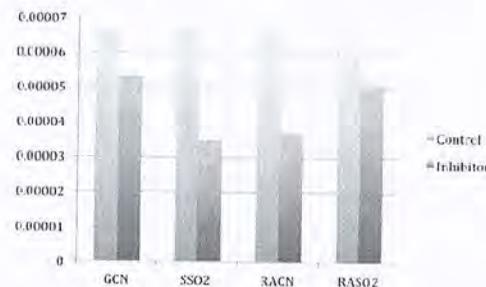


Figure 4. The protective effect of cathepsin-C inhibitors against hypoxia-induced necrosis in mouse muscle cells.

Identification of a Therapeutic Window for c-kit Inhibition to Extend Cardiac Regenerative Potential to Adolescence

Rebecca Garber¹, Rebecca Torres², Lin Tan², Nawazish Naqvi², Ahsan Husain²

¹Stern College for Women, Yeshiva University, New York, NY; ²Emory University School of Medicine, Atlanta, GA

After birth, cardiomyocytes terminally differentiate and lose the ability to proliferate and fully heal after cardiac trauma. The stem cell factor receptor, c-kit, is responsible for activating terminal differentiation. In mice, c-kit is expressed instantly after birth and tapers off by day P10. Since fetal hearts lack c-kit, their undifferentiated cells are capable of division and repair. Therefore, inhibiting early postnatal c-kit may promote cardiomyocyte proliferation after injury. c-kit is essential to multiple cell types and organogenesis, thus, it was crucial to develop an inducible system that restricts c-kit inhibition solely to the heart. Using a transgenic mouse model (alpha-MHC:T660M-ckit-Tg), which contains an inducible decoy c-kit receptor and allows for the inhibition of a functional c-kit, our lab has shown that these cardiomyocytes never become terminally differentiated. The cardiomyocytes in the transgenic mouse accumulate a greater number of cells by adolescence compared to mice where c-kit is not inhibited during the early neonatal period. Our lab has also shown that mice with a greater number of cardiomyocytes have improved contractile heart function, suggesting that the transient inhibition of c-kit between birth and preadolescence will potentially allow adolescent hearts to regenerate after injury.

Normal vs. Decoy Tyrosine Kinase Receptor Activity

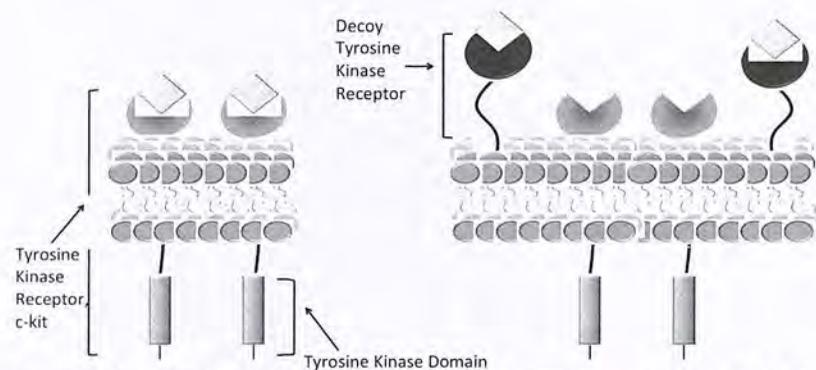


Figure 1. Growth factors bind to cell receptors. Normally, growth factors will bind to the transmembrane tyrosine kinase receptor c-kit (left). However, decoy receptors (right) prevent growth factors from binding to the c-kit receptor. Since the decoy receptors are only on the extracellular membrane, they do not cause any changes inside of the cell.

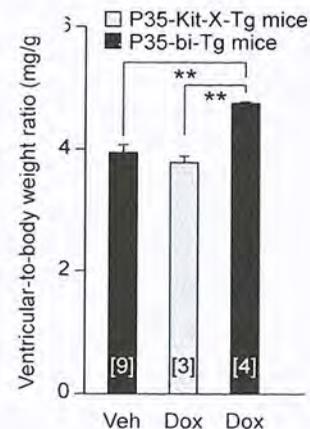


Figure 2. Doxycycline increases ventricular weight in bi-transgenic mice. The Kit-X and bi-transgenic mice were treated at the age of P1-P21 with either doxycycline (Dox) or vehicle (Veh). Ventricular-to-body weight ratio was determined at P35. There was a significant increase in ventricular-to-body weight ratio in the doxycycline treated bi-transgenic mice as compared to both doxycycline treated Kit-X mice and vehicle control mice. **P value <.05

Elucidating the Mechanism of BAX Activation by BIM-SHAB

Rachel Goldreich and Chaya Rapp

Department of Chemistry and Biochemistry, Stern College, Yeshiva University, New York, NY

The protein BAX (BCL-2 Associated X protein) regulates cellular life and death. When an alpha helical BH3 binds to the BAX protein the process of cell death is initiated. The first stage in the activation of BAX by BH3 is believed to be a conformational change in which the loop between $\alpha 1$ and $\alpha 2$ changes from a closed to an open position (Figure 1). The BIM-SHAB helix was designed to mimic the behavior of the BH3 activator in experimental studies of this system.

We used molecular dynamics to simulate the BAX protein and to monitor conformational changes that result from BIM-SHAB binding. Three systems were studied: the unbound BAX protein, the BAX protein in complex with the BIM-SHAB helix, and the BAX protein in complex with the BIM-SHAB after removal of the BIM-SHAB helix. Analysis and comparison of these simulations shows structural and dynamical changes in the $\alpha 1$ - $\alpha 2$ loop of the BAX protein that are associated with BIM-SHAB activation. The $\alpha 1$ - $\alpha 2$ loop of the BIM-SHAB bound BAX complex protein shows increased RMSD (root mean square deviation) values indicating that the loop structure changes from its initial position, and increased RMSF (root mean square fluctuation) values indicating greater flexibility for the loop in the bound relative to the unbound complex. The BIM-SHAB bound complex also shows greater distances, relative to the unbound complex, between the loop and $\alpha 1$, and the loop and $\alpha 6$, indicating that the loop opens away from the hydrophobic core of the protein upon activation (Table 1). Simulation of the BIM-SHAB bound complex after removal of the BIM-SHAB ligand shows decreased distances indicative of the loop reverting toward its closed position. These results support the hypothesis that upon activation of the BAX protein, the loop between $\alpha 1$ and $\alpha 2$ undergoes a conformational change from a closed to an open position.

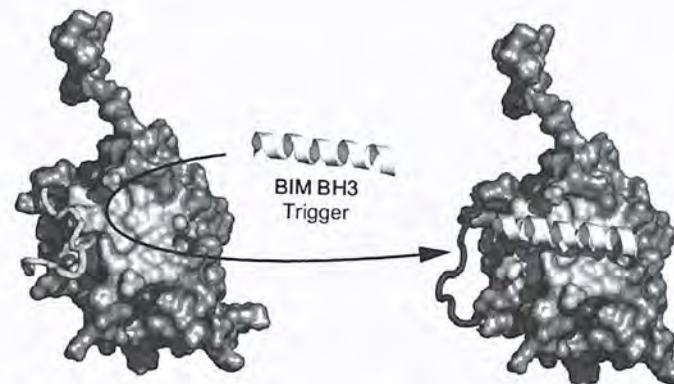


Figure 1. The $\alpha 1$ - $\alpha 2$ loop is believed to change from a 'closed' (green) to an 'open' (red) conformation upon BIM-SHAB activation (Gavathiotis et al. Mol Cell (2010) 40: 481-492).

Residues	Secondary Structure	Average Distance (Angstroms), Last 5 ns of Simulation		
		Unbound	Bound	Bound no ligand
L27/E44	Loop $\alpha 1$ - $\alpha 2/\alpha 1$	13.8	18.2	15.9
D48/G138	Loop $\alpha 1$ - $\alpha 2/\alpha 6$	15.6	20.8	16.1
E44/G138	Loop $\alpha 1$ - $\alpha 2/\alpha 6$	13.5	24.2	17.4

Table 1. Average distances during last 5 ns of simulations of unbound BAX, BIM-SHAB bound BAX, and BIM-SHAB bound BAX after removal of BIM-SHAB.

Assessing Pattern Completion in Spatial Navigation

Tamar Golubtchik¹ and Dr. Eitan Okun²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Brain Science Research, Bar Ilan University, Ramat Gan, Israel

Spatial learning is the process by which animals encode information about the environment in order to facilitate navigation through space and recall locations of motivationally relevant stimuli. Pattern completion refers to the ability to recall a previously learned location in space based on degraded or missing visual cues. Computational models of the hippocampus suggest that the CA3 sub region of the hippocampus can perform pattern completion. The Morris Water Maze (MWM) is a common behavioral task that assesses hippocampus-dependent spatial learning in rodents. In this task, mice are given three consecutive 90 second trials to find a hidden platform within a circular water pool. Once on the platform, mice are given 30 seconds to rest and observe the visual cues in the room (Figure 1). If the mouse is unable to find the platform, it is gently guided there. Latency to reach the platform as well as path efficiency are measured to determine performance of the mice in this task. We have utilized the MWM in order to test spatial pattern completion in healthy mice. To accomplish this, 45 young male mice were maintained in a controlled 12:12 hour light-dark reversed cycle. The mice were kept in a completely dark room, lit only with an infrared (IR) light to enable video tracking using an IR-sensitive camera. Four computer screens placed on each wall in the room provided visual cues for the mice.

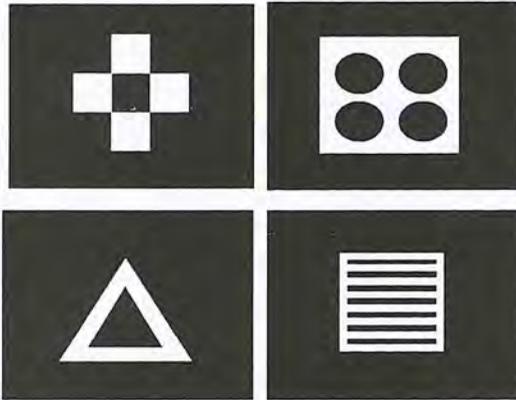


Figure 1. Four illuminated cues used during hidden and probe stages with 12cm x 12cm platform in upper right quadrant. Four LCD screens, each with one illuminated shape, were placed on each wall around the pool in plain sight of the mouse at a height of 118cm above the ground.

Initially, a visible platform stage was performed to assess the motivation of the mice as well as any visual or motor impairments that could potentially disqualify mice from this experiment. Following training of the mice using the hidden platform, during which optimal latency to reach the platform was obtained (Figure 2), mice were tested in the probe stage. During the probe stage, the platform was removed and the mice were divided into five groups, each with nine mice. Each group was tested and exposed to 4, 3, 2, 1 or 0 cues respectively. It was hypothesized that the groups of mice given more cues (4 or 3) would spend more time in the quadrant of the pool that had contained the platform compared with mice exposed to fewer visual cues.

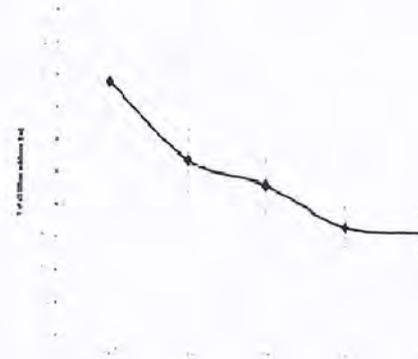


Figure 2. Plot of average test duration during the hidden platform stage with a 12cm x 12cm platform.

During the probe test, as hypothesized, the mice spent the most time in the platform quadrant with either four or three available cues (figure 3, 4a, b). When there were only 2, 1 or no cues available, the mice no longer spent a large amount of time in the platform quadrant (Figure 3, 4c, d, e).

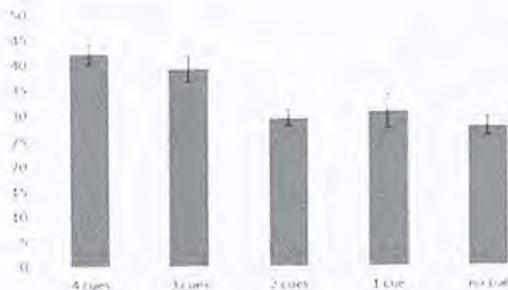


Figure 3. Graph of average time spent in lower right quadrant during probe test, based on how many visual cues were illuminated.

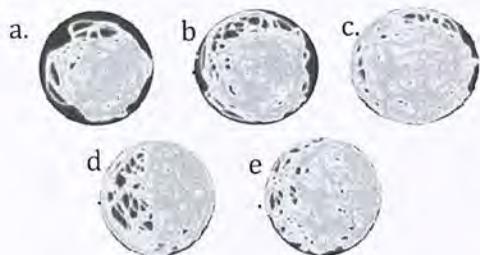


Figure 4. Occupancy plots illustrating the amount of time, on average, that the mice spent in each quadrant of the pool during the probe stage. This data is based on the number of visual cues present: (a) 4 cues, (b) 3 cues, (c) 2 cues, (d) 1 cue, and (e) no cues

As can be seen in figure 4, the mice spent the majority of swimming time in the platform quadrant (lower right quadrant) when presented with either 4 or 3 visual cues. When presented with 2, 1 or no cues, the mice spent relatively equal amounts of time in each of the quadrants. These findings are consistent with our assumption and suggest the mice use the mechanism of pattern completion during the MWM task.

Manganese-52: Cyclotron Production and PET/MR Imaging

Rebecca Gross¹, A. Lake Wooten^{2,3}, Benjamin Lewis³, Pamela Woodard, M.D.^{2,3}, Suzanne Lapi, Ph.D.^{2,3}.

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Biomedical Engineering, Washington University in St. Louis, Missouri; ³Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, Missouri

Manganese, a transition metal, is necessary for human biological functions primarily because it serves as a cofactor for many important enzymatic reactions. In large doses, however, it can cause an array of symptoms, ranging from neuropsychiatric dysfunction to Parkinson's-like tremors and muscle rigidity, known as manganism. In addition to its interesting natural and toxic roles, manganese also has medical imaging applications; the Mn^{2+} oxidation state has five unpaired electrons, giving it a high magnetic moment, which makes it an excellent contrast agent for magnetic resonance imaging (MRI). Manganese-52 (^{52}Mn) is a radioactive isotope with a half-life of 5.6 d that can be used for medical imaging by positron emission tomography (PET) because ~30% of all ^{52}Mn decay by positron emission. The half-life, abundance of positron emission, and low positron energy make ^{52}Mn a valuable PET agent. The interesting biological roles of manganese and the fact that MR and PET complement one another in terms of sensitivity and resolution, indicate that ^{52}Mn could be a useful radiotracer for PET/MR imaging.

Here, ^{52}Mn was produced by bombarding a natural chromium foil with ~13 MeV protons from the CS-15 cyclotron (The Cyclotron Corporation, Berkeley, California, USA) at Washington University School of Medicine (WUSM). The radionuclide was then separated from the target material through cation-exchange chromatography. The foil was first dissolved in concentrated hydrochloric acid, which produced Cr^{3+} and Mn^{2+} ions in solution. It was then reconstituted in 1.5 M sulfuric acid which caused a significant amount of Cr^{3+} to flow through, while the ^{52}Mn was immobilized on the column. Then, for some experiments, 0.5 M HCl was used to wash more Cr^{3+} off the column. Next, 10 mM hydrazine sulfate was passed through to ensure that all the manganese was in the Mn^{2+} oxidation state. Finally, multiple experiments were conducted to assess the elution of $^{52}Mn^{2+}$ in various solutions, including ammonium citrate, sodium chloride, and hydrochloric acid. Additionally, a variety of methods were used to quantify the Cr^{3+} fractions eluted from the column; these ranged from a qualitative assay that observed a color change when converting Cr^{3+} to Cr^{6+} to test strips for detecting chromate ($Cr(VI)O_4^{2-}$) in water to UV-Visible spectroscopy. Figure 1 shows the Cr^{3+} and Mn^{2+} peaks of several elution's with different solvents.

Phantoms were constructed that consisted of twenty-eight 15 mL centrifuge tubes with a gradient of both $^{52}\text{MnCl}_2$ and nonradioactive Mn(II)Cl_2 . This phantom was imaged using the mMR scanner (Siemens, Munich, Germany) at WUSM, a PET/MR scanner that contains a PET scanner inside of an MRI machine and can take simultaneous PET and MR images. A thirty minute PET scan was conducted, as well as numerous MR scans with varying inversion times (TI). Inversion times were chosen based on a previous experiment that had illustrated a relationship between TI, concentration of MnCl_2 , and MR signal. The images at short and long TI showed a range of MR signal for different concentrations of MnCl_2 . Additionally, a gradient of PET signal was observed, corresponding to the activity of ^{52}Mn in various tubes. Although these trends were generally similar to what was expected, the precise quantification of the PET signal differed from measurements taken prior to imaging, a result that deserves further investigation. Figure 2 illustrates one of these PET/MR images, with TI= 50 msec. The results illustrate that manganese-52 can be separated and imaged effectively; demonstrating its potential as a PET/MR agent.

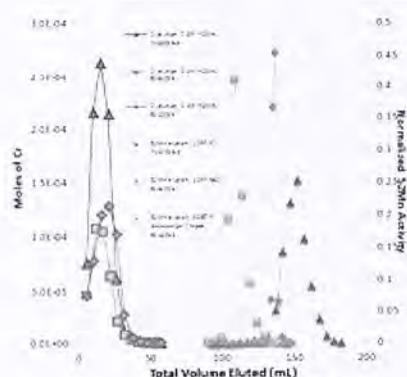


Figure 1. Elution curves for Cr^{3+} in 0.1 M sulfuric acid (left side) and for Mn^{2+} in various elements.

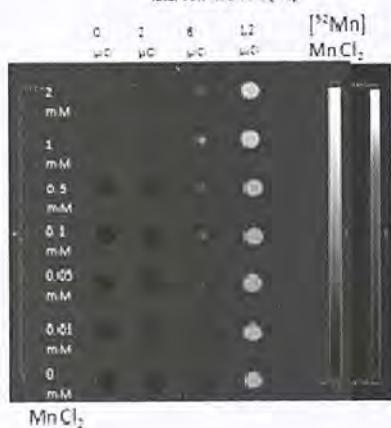


Figure 2. Co-registered PET/MR image of various nonradioactive MnCl_2 solutions (rows) with various activities of $^{52}\text{MnCl}_2$ added (columns).

The Innate Antiviral Response of HEK 293 Cells to VZV

Jennifer Grossman¹, Odeya Marciano², Professor Ron S. Goldstein²

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

The varicella-zoster virus, commonly referred to as VZV, enters the human body through inhalation. Once this virus enters its host, it infects lymphocytes, primarily in the tonsils, that carry it to the skin, where it causes a lysogenic (productive) infection in the form of lesions (chickenpox). The virus also infects sensory and sympathetic ganglion neurons, either via transport from the skin lesions or via infected lymphocytes. VZV remains latent in these peripheral neurons for many years. Often, stress causes the virus to reactivate, resulting in a lytic infection in the form of shingles, a debilitating and painful condition.

The exact method of the establishment of latency in neuronal cells remains elusive. However, Dr. Goldstein's lab at Bar-Ilan has found (unpublished) that when human embryonic kidney 293 cells (HEK 293) are infected with VZV, the virus enters but does not elicit a productive infection and its genome remains resident, which may serve as a model for latency in an easily grown and genetically modified cell line. PML bodies are structures in cells, including neurons, that have been proposed to play a role in innate immunity, by capturing VZV in cages in an attempt to prevent their replication. Therefore, we examined whether PML bodies might be involved in the prevention of productive infection in HEK 293 cells.

The normal distribution of PML bodies present was established by plating uninfected HEK 293 and ARPE cells onto coverslips and staining them with an antibody directed to PML after a 24-hour incubation period. PML bodies were present in both uninfected 293 cells (figure 1) and uninfected ARPE cells, but there appeared to be more PML bodies in the ARPE cells. I then evaluated the response of PML bodies in ARPE and HEK 293 cells to VZV infection. HEK 293 cells were plated onto coverslips and incubated for 24 hours. They were subsequently infected with VZV expressing RFP as a fusion protein with ORF66 (an immediate early protein) allowing visualization of live, infected cells by RFP fluorescence. After 24 hours, the cells were fixed and immunostained with an antibody to the PML protein to visualize PML bodies and an antibody directed against another immediate early protein, ORF62, to confirm infection. The VZV-infected HEK 293 cells displayed a very similar pattern of PML bodies to that of uninfected HEK 293. By contrast, VZV infection dramatically changed the pattern of PML body pattern in infected ARPE cells: after infection, almost no PML bodies were observed.

This experiment was then repeated using a different genetically- engineered VZV. HEK 293 cells and the ARPE cells were infected with VZV that

expresses GFP driven by an independent (not-VZV derived) promoter (VZV-GFP). After 24 hours incubation, the cells were fixed and stained with anti-PML. Again, PML bodies were not detected in infected ARPE cells and VZV-infected 293 cells did contain PML bodies (figure 2).

The complete disruption of PML bodies in ARPE cells that were infected with VZV suggests that this intrinsic immune response is not successful in preventing replication of the VZV virus in cells in which VZV elicits a productive infection. In contrast, the presence of PML bodies in HEK 293 cells that were infected with VZV suggests that PML bodies could be involved in the inability of HEK 293 cells to undergo productive infection. Further studies are needed in order to determine the contribution of PML bodies and other innate immune responses in preventing VZV replication in 293 cells.



Figure 1. Uninfected HEK 293 cell nuclei (blue) with PML bodies (red). Only a few PML bodies are observed.



Figure 2. HEK 293 cell nuclei (blue) infected with VZV sv40 GFP (green), and showing the presence of PML bodies (red). The infected HEK 293 cell nuclei stained positive for PML bodies. The white arrow points to an infected cell, while the orange arrow points to an uninfected cell.

Standardization of Trypan Blue Viability Assay for Cryopreserved-Thawed Hematopoietic Progenitor Cell Products

Hadassa Holzapfel¹, Carlo Palesi², Domenica Imperato², Anesa Mirza², Ljiljana V. Vasovic^{2,3}

¹Department of Biochemistry, Stern College for Women, Yeshiva University, New York, NY; ²Department of Pathology, Montefiore Medical Center, Bronx, NY; ³Albert Einstein College of Medicine, Bronx, NY

Hematopoietic progenitor cells (HPCs) can differentiate to various specialized blood cells and form the basis of cellular therapies for patients with cancers and other disorders of the blood and immune systems. The cellular therapy product (CTP) containing HPCs can be obtained directly from the bone marrow or can be collected by an apheresis procedure after HPCs are mobilized into circulating blood. Collected CTPs inevitably also contain variety of other blood cells including maturing white blood cells (WBC), red blood cells (RBC) and platelets. Cryopreservation then allows CTP to be stored at -80°C to -196°C until the transplant is medically indicated. The cell viability is reduced after CTP cryopreservation and cryogenic storage. Nowadays, laboratory determination of the CTP viability is a measure of product quality and is traditionally based on:

1. Trypan blue (TB) assay for total cellular viability. HPCs appear *in vitro* as ordinary white blood cells and it is not possible to identify them morphologically by traditional staining methods, including TB.
2. 7AAD in combination with CD34, an immature cell surface protein marker, can specifically estimate viability of HPCs via flow cytometry.

Both methods are standardized and optimized for staining of fresh CTPs post-collection. Trypan blue (TB) has a high molecular weight which makes it relatively impermeable to the highly selective membranes of live cells. However, dead cells have damaged membranes which allow trypan blue to permeate, showing a distinctive blue color of the nuclei under the microscope.

The viability determination of cryopreserved CTP after thawing, immediately prior to the transplant, is challenging and difficult to standardize as traditional cryoprotectant containing DMSO is cytotoxic in time related manner and DMSO also interferes with a viability determination. This is seen with both viability methods but especially flow cytometry technique, necessitating use of TB for post-thaw samples. In addition, the TB assay is usually conducted by counting cells with a hemocytometer. Technicians vary in their viability counting due to counting speed and challenge of cell identification. This is a critical parameter for the

assay standardization. Therefore, a standardized and reproducible viability method is needed.

Our goals were to improve trypan blue assay sensitivity and accuracy to determine viability in cryopreserved, thawed samples, standardize interobserver variability, improve test result documentation and, ultimately, use the improved assay to optimize the post-thaw process and improve viability of HPC-CTP.

Fresh HPC, apheresis CTPs collected from peripheral blood were processed immediately. A sample was taken pre-manipulation and post-centrifugation after addition of a cryopreservative containing 10% DMSO.

Frozen CTP bags were thawed in a 37°C water bath and split into two aliquots:

1. Unmanipulated, undiluted CTP
2. 10% Dextran 40 solution in saline gently diluted 1:2

Cell viability was counted by trypan blue neat or first diluting each sample 1:10 with either saline or Dextran 40 and then staining with trypan blue 1:2. Microphotographs were documented by using the Nikon Eclipse Ti microscope and NIS Elements D software.

The cell viability of a fresh, pre-manipulation CTP was not affected by sample dilution method. The viability of the fresh cells decreased after the addition of DMSO-cryopreservative. The sample dilution with saline decreased viability of the cells more than the dilution with Dextran 40.

The cell viability of thawed products was most preserved when first diluting the sample with Dextran 40, then trypan blue 1:2. Furthermore, thawed, undiluted CTP samples had lower viabilities than samples diluted 1:2 with Dextran 40.

In conclusion, the viability of fresh, unmanipulated cells can be accurately determined using a standard trypan blue staining protocol. Cell dilution with saline to optimize sample concentration does not affect viability results. The viability result of fresh cells in 10% DMSO-based cryoprotectant is directly affected by a diluent. Saline dilution significantly decreases viability results while Dextran 40 dilution maintains accuracy of the assay. The viability of cryopreserved, thawed CTP is significantly decreased by diluting in trypan blue neat or saline. Dextran 40 dilution maintains high viability of cells for an extended period of time. All in all, we optimized the trypan blue viability assay using photomicroscopy to reduce variability of results amongst technologists.

Investigation of the Interaction between the p53 Tumor Suppressor and RNA Polymerase II Using Biochemical Analysis

Shira Kaye¹, Sameer Singh², Lihua Song², Wei-Li Liu²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY

In response to cellular stress, the p53 tumor-suppressor protein, or “guardian of the genome,” becomes activated. Along with many other regulatory functions, p53 induces cell cycle arrest, repairs DNA, and even promotes apoptosis (programmed cell death) in the event of DNA damage by activating transcription of certain target genes. p53 activates transcription by binding to its response element, a short specific sequence of DNA in the promoter region. In over 50% of cancers, however, p53 is mutated and therefore unable to carry out its regulatory functions. There are certain hot-spot mutations in the DNA-binding domain of p53 prevalent in human cancer, such as R248Q.

p53 has been shown to recruit components of the pre-initiation complex (PIC), a large group of proteins that assembles immediately upstream of the transcription start site. Components of the pre-initiation complex include the general transcription factors TFIIA, TFIIB, TFIID, TFIIF, TFIIE, TFIIH, and RNA Polymerase II (Pol II). Once Pol II joins the PIC, it begins the process of transcription by moving along the DNA strand downstream, making mRNA. This mRNA will undergo translation into the necessary proteins.

p53 has been shown to bind and recruit TFIIA, TFIID, and TFIIF to the PIC. My research project was to determine if p53 can also directly interact with Pol II. Co-immunoprecipitation assays will be performed to address this key question.

Co-immunoprecipitation assays involve adding a specific anti-Pol II antibody to a Pol II and p53 mixed solution. We then added protein-G beads in order to capture the anti-Pol II antibody and its precipitates. To determine whether or not p53 binds to Pol. II, immunoprecipitates were analyzed using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) and western blot analysis using mouse α -p53 and mouse α -Pol II antibodies. The results are shown in Figure 1. Both wild-type and the cancer mutant R248Q p53 proteins were visible on the membrane at a band corresponding to 53 kDa in size, indicating that p53 indeed binds Pol II in the absence of DNA.

Wild-type p53 binding Pol II can reveal critical information regarding the assembly of the pre-initiation complex. Interestingly, the cancer-derived mutant p53 also binds Pol II, but perhaps the binding is not effective. The stability of the interaction between the cancer mutant R248Q p53 and Pol II needs to be further examined via additional biochemical assays. Furthermore,

future label transfer assays will be conducted to map the binding interface of the Pol II/p53 interaction.

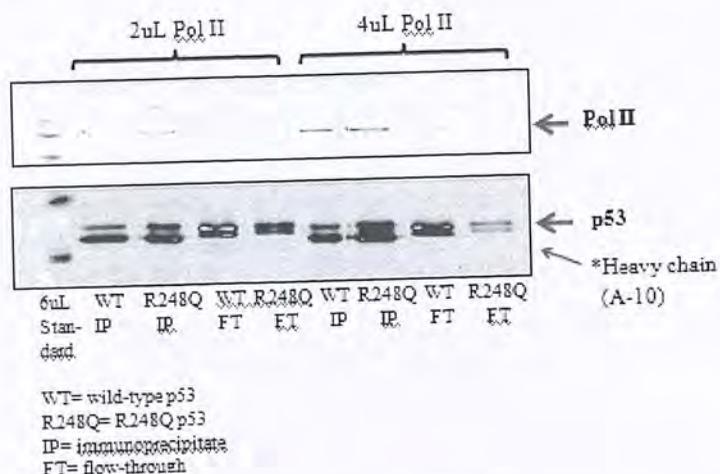


Figure 1. This assay was performed three times. Representative western blot results are shown. p53 is present in the immunoprecipitates as indicated by the bands visible at 53 kDalton on the western blot. Therefore, both wild-type p53 and cancer mutant p53 R248Q bind Pol II in the absence of DNA.

Drugged Wildlife: The Potential Impacts of Environmental Endocrine Disruptors on Reproductive Development

Melissa Kramer¹, Nicole McNabb², Louis J. Guillette, Jr.², Satomi Kohno²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Marine Biomedicine and Environmental Sciences, Medical University of South Carolina, Charleston, SC

The growing use of oral contraceptives and hormone therapeutics gives rise to the concern that estrogenic and progestogenic compounds are present in wastewater at concentrations that may affect the reproductive health of aquatic species. This study showed that wastewater effluent produced by the Charleston Water System facility at Plum Island, when concentrated 100 times, contains endocrine active compounds at high enough concentrations to activate the human nuclear estrogen and progesterone receptors in an *in vitro* transactivation assay system. This may provide a mechanism for the alterations in secondary sex characteristics that have been reported in fish exposed to wastewater effluent from other locations. Some synthetic hormones have also been shown to bioaccumulate in teleost fishes. There is, therefore, potential for humans to be exposed to these endocrine active compounds through consumption of these fish. The current study evaluated the effects of neonatal exposure to progestogens on the reproductive development of estradiol (E₂)-stimulated adults, using mice as a model. Quantitative PCR analysis of target genes from adult mice treated with the synthetic progesterone 17 α -hydroxyprogesterone caproate (17PC) as neonates suggested that developmental exposure to progestogens might decrease sensitivity to E₂ at the uterine transcriptome level. The results showed patterns similar to microarray data that revealed that perinatal exposure to 17PC suppressed uterine E₂ sensitivity in the adult. These data indicate a need for further exploration of the long-term impacts of neonatal progestogen exposure on reproductive development.

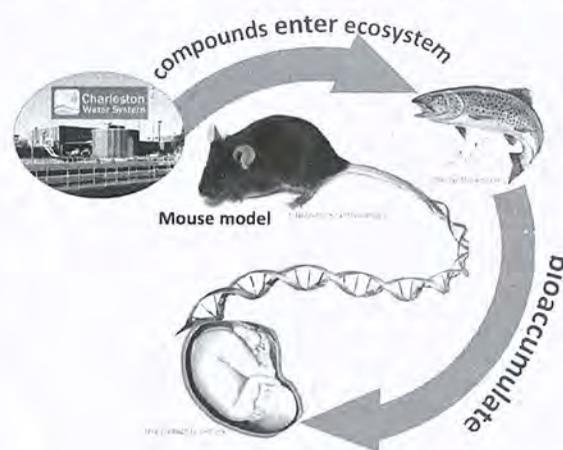


Figure 1. Hypothesized path of endocrine disrupting compounds through the environment, from wastewater to aquatic animals to humans. A mouse model was used to evaluate potential effects of neonatal endocrine disruption on adult reproductive development.

The Deformation of 3D Images Using Moving Least Squares and the Complex P2P Cauchy-Green Method

Michelle Levine¹ and Ofir Weber²

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

The goal of this research is to create an efficient algorithm to deform images while maintaining a realistic picture. An image can be transformed by setting a mathematical path for each vertex from its original position to the new deformed location. Simple transformations include translation, scaling, and rotation in 2D and 3D polygons. Translation is when the image is shifted, but all points, angles, and lines remain the same relative to each other. It moves every point a constant distance in a specified direction. Scaling entails enlarging or shrinking an image, leaving angles the same but extending lines or points in a quantified direction. The 3rd type, rotation, provides a specific map in which everything in the image moves around a designated axis or point.

In this particular project, we are trying to find an effective way to transform an image by moving a vertex and simultaneously mapping paths for the surrounding vertices. One method that has been developed is to deform images using Moving Least Squares. In this technique, the paths of the vertices are determined by continuous functions, which are calculated by a weighted least squares quantity. The points surrounding the chosen vertex are more greatly affected than those farther away from the focus.

Three classes of linear functions used in MLS (Moving Least Squares) deformations are affine, similarity, and rigid transformations. Affine transformations have a linear transformation followed by a translation: $Ax + b$ (Matrix A, vector b). The issue with this class is that the transformation often results in non-uniform scaling, causing the image to lose its realistic nature. In similarity transformations, only translation, rotation, and uniform scaling are allowed. These restrictions are established by constraining the matrix M to follow $M^T M = \lambda^2 I$ for some scalar λ . Similarity transformations better preserve the angles between points, as compared to the general affine deformations, but still allow for scaling in undesirable areas. This leads us to rigid deformations in which angles are maintained and even uniform scaling is not allowed. The matrix M, in this class, is constrained to $M^T M = I$, and the mathematical function is altered accordingly. The deformation now preserves rigidity and scale locally so that the relative shape of the original image is retained. The differences in each of these classes are shown in the images below, where in (b), the general affine transformation causes non-uniform scaling in the arms and torso, in (c), the similarity transformation scales the size of the arm as it is stretched, and in (d), the rigid transformation provides a more realistic deformation. These methods can

also be extended to using line segments as the focus point, rather than sets of points.

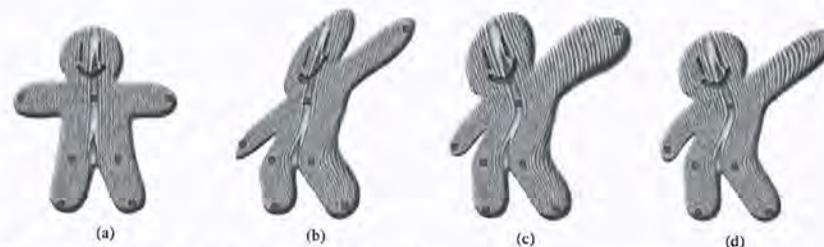


Figure 1: Deformation using Moving Least Squares. Original image with control points shown in blue (a). Moving Least Squares deformations using affine transformations (b), similarity transformations (c) and rigid transformations (d).

The issue with these methods of deformation is that the weighted Moving Least Squares calculation determines the affect on other points based on proximity to the requested point, without taking into account the borders of the image. This causes issues when there are two vertices in close proximity with each other but separated by a border. The 2nd vertex will have a larger deformation than intended, causing an unrealistic and warped result. Professor Weber and his colleagues came up with the P2P Cauchy-Green method in which the borders of the image are calculated and the points are then weighted within those boundaries. The difference between the two methods is shown clearly in the left image below, in which the MLS deformation causes a warped result in the frog's knee, while the P2P method effectively separates the vertices based on the image border. In the image on the right, the border restricts the coordinates of the point and the effects on the surrounding region in P2P, but in MLS, the effect spills over into the nearby knee. The ongoing research focuses on potentially using complex numbers in order to weigh the proximity of the surrounding vertices.

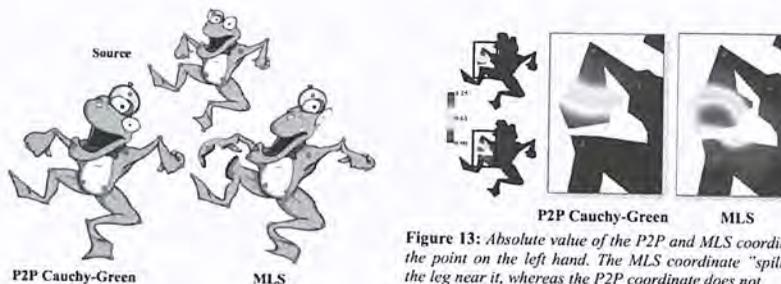


Figure 13: Absolute value of the P2P and MLS coordinates of the point on the left hand. The MLS coordinate "spills" into the leg near it, whereas the P2P coordinate does not.

In order to test these deformations, we use the Maya 3D animation software to create 2D and 3D images, which we can then manipulate using the commands already installed within the software. However, another aspect of the research has been in coding Maya plugins, extensions for the animation software, in C++, Maya API, and MATLAB. In my project, I wrote code for the ColorMeshVerticesCmd that creates two empty color sets; the Valence Color Set arranges the color of the polygon based on the number of connected vertices for each vertex, while the Gaussian Curvature Color Set adjusts the colors based on the Gaussian curvature of each vertex. The Gaussian curvature is determined by subtracting the sum of the angles of the adjacent triangles from either 2π (for a non-boundary vertex) or π (for a boundary vertex). This command is performed on a polygon that has a triangular mesh, meaning that the image is broken down into a set of triangles on all faces. The last part of the project was to create the InverseMatrixCmd. The matrix is created in C++ using the GMM Library and then inverted using MATLAB-Maya interface code.



The Role of SIRT6 in Metabolism and Beta Oxidation

Sara Lis¹, Shoshana Naiman², Professor Haim Cohen²

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

As modern science and medicine have increased human longevity, age-related metabolic diseases, such as hypertension and diabetes type II, have risen in prevalence. For years, it has been known that a caloric restricted diet slows aging and extends lifespan. Thus, it is possible that calorie restriction may be able to moderate the effects of metabolic diseases. Professor Haim Cohen's lab is concerned with this relationship and researches the metabolic pathways, primarily focusing on the SIRT6 enzyme. SIRT6 is part of the sirtuin family, a group of NAD⁺-dependent deacetylases that have been shown to be involved with the metabolic pathway and critical in the regulation of longevity.

Previously, Professor Cohen's lab has shown that SIRT6 is, in fact, involved with the metabolic pathway and regulating diets. In a past experiment, SIRT6 levels increased in response to caloric restriction, indicating that SIRT6 may be a regulator of the metabolic response to caloric restriction. In addition, mice deficient in SIRT6 were small and had metabolic deficiencies compared to normal mice, and died prematurely, displaying multiple aging-like phenotypes. Furthermore, mice that were genetically altered to overexpress SIRT6 were found to be able to maintain normal homeostasis when fed a high-calorie diet compared to their wild-type littermates, again indicating the enzyme's role as a regulator in the metabolic pathway. Male mice overexpressing SIRT6 had an extended lifespan of about 15% compared to normal mice.

Since SIRT6 was found to be connected to metabolism and high-fat diet, we decided to investigate the role of SIRT6 in beta oxidation, the process of breaking down fatty acids during starvation. Recent research performed in our lab included treating both normal mice and mice overexpressing SIRT6 with WY 14,643, a specific PPARA activator which activates beta oxidation. This treatment mimics starvation, possibly by activating SIRT6. We performed a genome-wide microarray analysis to measure over 30,000 genes in both normal and SIRT6 mice. We analyzed the data and found several beta oxidation genes were indeed specifically altered in SIRT6 mice, confirming our initial hypothesis that SIRT6 regulates beta oxidation. Further validations using real-time PCR are necessary to finalize these exciting preliminary results. To this end, specific gene sequences were analyzed and primers were ordered for these genes for qPCR.

In addition to the changes in gene expression, we wished to find a phenotype in SIRT6 mice connected to beta oxidation. Thus, we excised livers of WY-treated mice and prepared them for analysis at Duke University. Samples are

currently undergoing analysis to measure acyl-carnitine levels, a marker of beta oxidation in tissues. This is a metabolite produced by breakdown of fatty acids that occurs during beta oxidation. Positive results could explain the mechanism by which SIRT6 protects against high fat diet, and may partially explain the longevity enjoyed by SIRT6 mice.

In addition to WY treatment, in order to conclusively find a phenotype for beta oxidation in SIRT6 mice, another set of mice were starved in parallel to the WY treatment. These mice were placed in metabolic cages, which have been calibrated to regularly measure various physiological patterns, such as food/drink intake, activity, RER (respiratory ratio) and temperature of each mouse. After the normal and starvation period (which was performed over a number of days) the data was analyzed to find changes in mitochondrial activity. During starvation, most energy comes from beta oxidation in the muscles as opposed to glycolysis, and therefore positively correlates with the RER ratio. The data showed that the RER levels of the SIRT6 overexpressed mice were significantly higher than the levels of the normal mice, indicating that SIRT6 may play a role in maintaining oxygen levels during caloric restriction. These preliminary results give a strong indication that SIRT6 positively regulates beta oxidation during starvation, and possibly high fat diet as well. These results and future results hold much promise in using SIRT6 as a potential therapy for various metabolic diseases.

The Role of Cholesterol in Chagas Disease

Tamar Ariella Lunzer¹, Vanessa Almonte³, Calvin Law², Herbert Tanowitz³, Louis M. Weiss³, Fnu Nagajyothi³

¹Stern College for Women New York, NY; ²Bronx High School of Science, Bronx, NY; ³Department of Pathology, Albert Einstein College of Medicine, Bronx, NY

Chagas disease, a chronic illness caused by the parasite *Trypanosoma cruzi*, is one of the leading causes of cardiomyopathy in Latin and South America, where it is endemic. However immigration has led to the spread of this disease thereby increasing its global impact. Studies have shown that *T. cruzi* has a high affinity for lipoproteins and cholesterol. Additionally, the parasite binds to the LDL and scavenger receptors, which is a critical step in the mechanism of cell invasion. Furthermore the infection of a cell with the parasite induces an overexpression of LDL receptors. We sought to investigate the role of serum cholesterol in the pathogenesis and progress of Chagas disease, particularly in the acute phase. For our experimental model we employed the use of *T. cruzi* infected PDZ Domain Containing 1 knock-out (k/o) mice, which are both phenotypically and genotypically "normal" except that they have abnormally high rates of serum cholesterol. We studied the heart tissue of these mice and measured various manifestations of infection. The methods we used to study this issue are immunoblot analysis, qPCR, histological staining, and trichrome staining. We found that PDZK1 k/o mice had a very large increase in the rate of parasitemia, parasitic load and mortality as compared to the wild type mice (Figures 1-3).

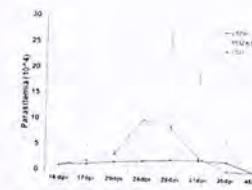


Figure 1. Parasitemia



Figure 2. Parasite load

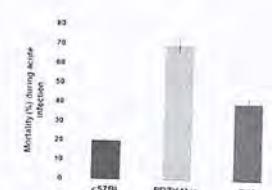


Figure 3. NAG 601

Additionally, there was a significant increase in vasculitis, inflammation, fibrosis, and amount of adipocytes in the k/o mice as compared to the wild type. PDZK1 k/o heart mRNA levels of the genes involved in lipid internalization and lipogenesis followed a drastically different pattern than those of the control mice, likely due to the fact that by day 30 post infection the infected k/o mice were dying. There was increased cholesterol efflux (based on ABCA1 expression) during acute infection in the wild type while uninfected PDZK1k/o mice demonstrated significantly increased ABCA1 expression compared to both infected and uninfected wild type. Based on these preliminary findings there is a relationship between increased serum cholesterol and the pathogenesis and mortality rate of Chagas disease. Future studies which focus on the mechanism of this relationship may produce findings that can further improve our understanding and clinical care for those infected and affected by this illness.

miR33 Inhibition Overcomes Deleterious Effects of Diabetes on Atherosclerosis Plaque Regression in Mice

Esther Marciano¹, Tessa Barrett², Dr. Edward A. Fisher MD²

¹Stern College, Yeshiva University, New York, NY; ²New York University School of Medicine, Langone Medical Center, New York, NY

Diabetes is known to increase cardiovascular risk in humans, even when using drugs to lower cholesterol levels. In the same way, mice with diabetes do not show decreased levels of plaque buildup despite the lowering of cholesterol levels. Atherosclerosis is the hardening of arterial walls and the formation of plaque due to the buildup of cholesterol and other substances. This buildup can lead to heart attack, stroke, and other cardiovascular problems. miR33, a microRNA, is a key negative regulator of ABCA1 and high density lipoprotein, HDL. ABCA1 and HDL are reverse cholesterol transport factors, carrying cholesterol from tissues back to the liver and thus decreasing cholesterol and plaque buildup.

In our study, we worked on assessing the effects of miR33 inhibition on atherosclerosis regression in diabetic mice. Since miR33 inhibition would increase plasma HDL levels, we suggested that it could help protect against atherosclerosis notwithstanding the negative effects of diabetes. In the experiment, mice were placed on an atherogenic diet for 16 weeks. After that, some mice were made diabetic, or hyperglycemic by injection and others were kept normal, or normoglycemic. Mice were then treated with anti-miR33 or a control. The diabetic mice that were treated only with the control did not show decreased levels of plaque buildup, even when lipid levels were lowered by Microsomal triglyceride transfer protein (*Mttp*) gene inactivation. On the other hand, diabetic mice that were treated with anti-miR33 did show decreased plaque macrophage content.

We also looked at the necrotic core of the plaques to have a qualitative readout of the macrophages. The necrotic area of a plaque represents the ability of macrophages in the plaque to remove dead or necrotic cells. Greater amounts of necrosis indicate that the macrophage cells in the plaque are unable to effectively clear the area of dead or dying cells and this is recognized as an issue in atherosclerotic plaques.

We wanted to know if when we treated our mice with anti-miR33 we could improve the nature of plaques in diabetic mice. We measured the necrotic core in each of the different types of mice. In the normoglycemic mice, there was not much of a difference between the mice that were given the control versus the mice that were given the anti-miR33 "drug". However, a significant difference was seen when measuring the necrotic core of the diabetic mice given the control and the diabetic mice given anti-miR33.

Our research indicates that when the mice were diabetic they were unable to effectively remove dead cells via phagocytosis, but when the mice were diabetic and were given the anti-miR33 drug their ability to remove dead cells was restored and less amounts of necrosis was observed. These results show that negative effects of diabetes on plaque macrophages could be suppressed when treated with anti-miR33.

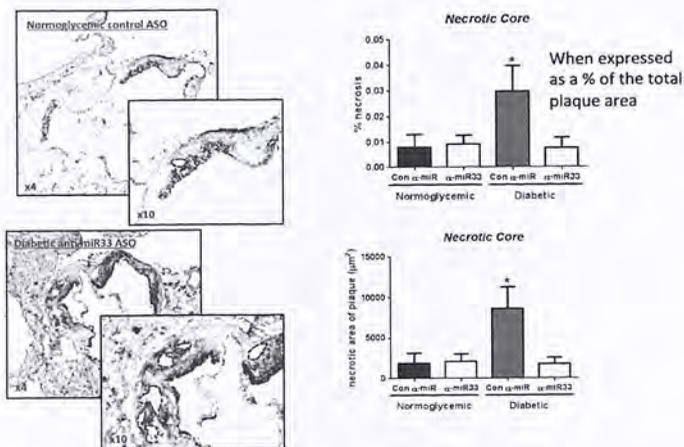


Figure 1. Necrotic core in plaque of normoglycemic and hypoglycemic mice when treated with control and with anti-miR33.

Flow Properties of Stored Red Blood Cells and Transfusion Outcome

Rachel Mirsky¹, Mordechai Chern², Dr. Ariel Orbach³

¹Stern College for Women, Yeshiva University, New York, NY; ²Yeshiva College, Yeshiva University, New York, NY; ³Department of Biochemistry, The Hebrew University-Hadassah Medical School, Jerusalem, Israel

Blood transfusions are common lifesaving procedures and are crucial in treatment of anemia, polytrauma and major bleedings. Over a hundred million blood units are collected annually and stored in blood banks. It is well known that red blood cells (RBCs) undergo hemolysis during storage; therefore they are stored in preservative solutions at 4°C for no longer than six weeks. As RBCs age, they lose their flexibility, which impedes their ability to transport oxygen and other molecules through capillaries. Storage accelerates the aging process of RBCs resulting in a greater clearance when RBCs from the stored blood unit are introduced into the recipient's blood stream, which is counterproductive to the transfusion.

According to the Food and Drug Administration (FDA), it is required that at least 75% of the donor's RBCs remain in the recipient's body in the 24 hours after transfusion. Currently, there is no practical method to measure conformance to these guidelines. No test for donor RBC survival is routinely performed, and meta-analysis research on RBC survival shows that in many cases, especially in RBC units stored for two weeks or more, transfused RBCs do not meet the FDA's requirement (75% survivability).

RBC survivability can be measured using flow cytometry (FACS). The donor cells, tested for certain antigens not found in the recipient, then the blood of the recipient is tested for those antigens immediately and then at 24 hours post transfusion. By utilizing antibodies that are specific for these antigens one can differentiate between cells from the donor and cells from the recipient and determine the survivability of donor cells post transfusion (Figure 1).

RBCs that come from different donors have different flow properties (FP), e.g. flexibility/rigidity characteristics. One of the important key factors in FP is the elongation ratio (ER), the ratio of the length versus the height under shear force. When the cell is flexible it is elliptic (1.6-1.9 ER), as opposed to a rigid cell, which is spherical (1.0-1.5 ER) under the same conditions. The extent of RBC deterioration during storage corresponds to the ER of the donors' RBCs; cells with higher ERs can be stored for a longer period, and can still yield high survivability post transfusion. We tested the FP of RBCs from different donors and tested their respective survivability rates using FACS.

The Effect of 'Molecule 260' on Pancreatic Cancer Cells

Ahava Muskat¹, Yoav Elkis², Uri Nir²

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

In Professor Uri Nir's laboratory, the Fer kinase, a molecular trigger for cancer cell proliferation and metabolism is currently being studied. The Fer kinase sustains cancer cell survival even while the cell is under starvation conditions. Cancer cells tend to undergo mitochondrial transformations with the purpose of maintaining specific metabolic needs as well as ensuring their ability to promote tumor growth. The Fer kinase functions in this way. Some specific functions of the Fer kinase include regulation of cytoskeletal organization, cell adhesion, cellular response to cellular insults, and the ability to protect cells from ionic radiation. When tested, Fer was found in all human malignant cell lines. Moreover, Fer was expressed in higher levels in malignant tumor cell lines than in benign tumor cell lines. Additionally, when Fer was down regulated in breast, prostate and colon carcinoma, proliferation of these cells was impaired. Down regulation of Fer was also found to prevent breast and lung tumor formations.

These studies and others prompted Nir's lab to study the intracellular tyrosine kinase in depth. Additionally, the laboratory studied the truncated version of Fer called FerT. FerT has a slightly different molecular structure than Fer. While the two enzymes maintain the same kinase domains, the N-terminal tails differ and FerT lacks the N-terminal functional elements found in Fer. In Professor Nir's laboratory, both of these enzymes were shown to be associated with mitochondrial complex I in colon carcinoma cells. Fer functions with regard to complex I to maintain steady metabolism of cells even under low nutrient and oxygen environments. Moreover, when Nir's lab ectopically transfected nonmalignant cells with Fer directed towards the mitochondria (they used NIH3T3 mouse embryonic fibroblast cells), the cells were transformed to having the ability to form tumors. Seeing the immense and significant capabilities endowed to cells when up-regulated with Fer, Nir's laboratory is currently in the process of creating a drug to target this kinase with the hopes that if major metabolic capabilities of cancer cells could be impaired, cancer cells would die.

After an extensive series of cellular experiments, Nir's laboratory discovered that a specific molecule—"molecule 260"—when applied to certain carcinoma cells, was successful in targeting the intracellular tyrosine kinase Fer; specifically when this molecule was applied to prostate, colon and breast cancer cells. Currently, we are in the process of researching the effect of "molecule 260" on pancreatic cancer cells as well. One experimental technique that is being used to determine the effect of "molecule 260" on pancreatic cancer cells is through analyzing the results of several MultiTox-Fluor Multiplex Cytotoxicity Assays. This assay involves two different types

Although the FP of RBCs can be measured in the laboratory, the device used in this research, the CFA (Computerized Flow Properties Analyzer), is impractical for use in blood banks because it is costly and requires highly skilled operators. Therefore, we utilized mass spectrometry to link the change in FP to an increase or decrease in protein expression level. The mass spectrometry test discovered candidate proteins that are highly correlated to the FP. Those proteins found to have a strong correlation with the FP were tested with direct and indirect ELISA tests to determine whether or not the changes in the amounts of certain proteins during aging, as detected by the mass spectrometer, were significant enough to serve as measures of the FP in this format.

In conclusion, blood transfusion is an important procedure in today's medicine, however blood units are not tested for the quality of the RBCs in regards to their flow properties and other key factors (e.g. amount of hemoglobin). We are working on developing methods to measure these parameters so they can be implemented into the routine blood bank tests. Our goal is to create an easy to use, cost effective test that will replace the common practice of "first in first out" blood bank inventory management and will improve transfusion outcome and benefit the patients.

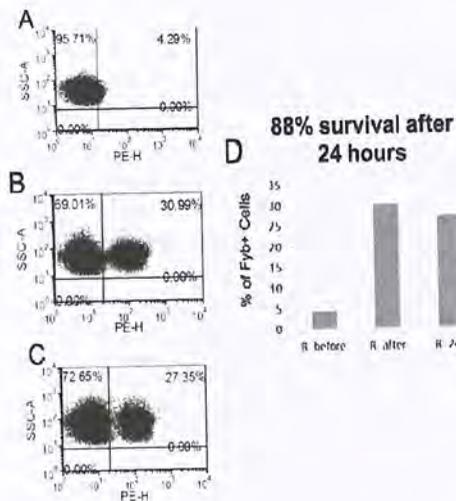
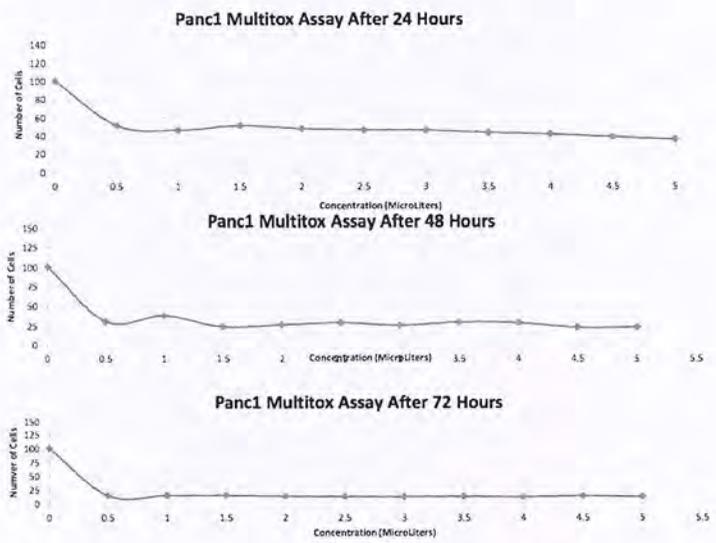


Figure 1. RBC's were blood typed for the following sub-blood types: M, N, S, E, C, c, Fya and Fyb antibodies. Donor's RBCs expressed Fya, whereas the recipient's RBCs did not. The blood sample that was taken before transfusion (Fig. A) was stained to validate that the recipient's RBCs did not express the Fya antigen and to have a reference point for non-specific staining. We measured the percentage of donor's RBCs right after transfusion (Fig. B) and 24 hours after transfusion (Fig. C) to determine how many donor RBCs survived after 24 hours. The decrease in donor's RBCs in this case was minimal and represented 88% survival.

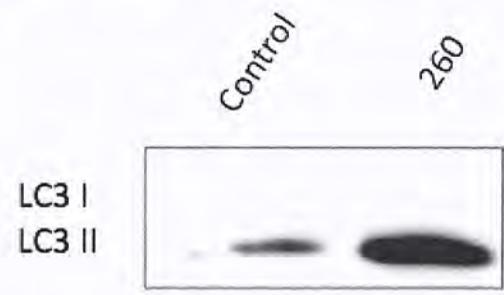
of proteases that work respectively on dead and live cells determining the cells viability or cytotoxicity (death) after incubation with a specific substrate. The data is normalized and, thus, it is able to be easily analyzed. We performed this assay a number of times and recorded the results of Panc1 cells (pancreatic cancer cells) applied with “molecule 260” in different concentrations and exposure durations for 24, 48, and 72 hours. The results indicated that the number of live cells decreased as the concentration of “molecule 260” increased. Additionally, the number of live cells decreased from Panc1 cells applied with concentrations of “molecule 260” incubated from 24 hours to 72 hours, with the Panc1 cells incubated with “molecule 260” for 72 hours maintaining the least number of live cells after performing the assay. The results of this assay maintained in fact “molecule 260” does target the key enzyme Fer and impairs its ability causing metabolic functions of cancer cells to be compromised. Additionally, the targeting of Fer possibly impaired the cells’ cytoskeletal organization and cell adhesion. All of these functions are vital to a cells’ viability. As Fer was targeted and these functions were impaired, the cells died indicating a lower number of live cells.



We then continued with an analysis of a series of Western Blots. The protein extractions used as samples for the Western Blots were extracted from 24hr, 48hr, and 72hr incubations of pancreatic cancer cells with “molecule 260” and their respective incubations with a control molecule. The results of the Western Blots were meant to indicate if the death of these cells is mediated by autophagy. In all cells, LC3, a soluble microtubule-associated protein aids in the process of autophagy. When autophagy is induced, LC3, or LC3-I, forms LC3-II through its conjugation with phosphatidylethanolamine. One of the known purposes of LC3-II’s formation is to facilitate the fusion of autophagosomal membranes with lysosomes for degradation. Analyzing the

relative width of the LC3-I and LC3-II bands indicate the levels of autophagy induced. The secondary antibodies used in the Western Blots were mouse antibodies.

The results of the Western Blot testing pancreatic cancer cells incubated with “molecule 260” indicated that the pancreatic cancer cells applied with “molecule 260” showed thicker LC3-II bands than pancreatic cancer cells applied with a control molecule demonstrating that pancreatic cancer cells applied with “molecule 260” activated autophagy, probably in order to survive. Cancer cells applied with the control molecule did not show clear autophagy induction.



Currently, the laboratory is processing the results of the other Western Blots to determine if the pattern continues with pancreatic cancer cells incubated with “molecule 260” for 48 hours and 72 hours. The laboratory will continue analyzing the effect of “molecule 260” on pancreatic cancer cells through other methods such as immunohistochemistry. Eventually, the goal of Professor Nir’s laboratory is to develop a drug using “molecule 260” to kill different types of carcinoma cells by targeting Fer.

Comparison of xTAG RVP Fast Assay (Luminex) to the eSensor RVP (GenMark Dx) and FilmArray RP (BioFire)

Chana Ratner¹, Sarah Saxena², Richard Henry M.S.³, Amy Fox M.D., M.S.³

¹Stern College for Women, Yeshiva University; ²Scarsdale High School; ³Department of Virology, Montefiore Medical Center

Respiratory viruses cause infection in the lungs and respiratory tract¹ and are an important cause of hospitalization, most significantly in immunocompromised patients. Symptoms of these viruses can range from a mild cough to a more severe illness which may lead to fatalities; therefore, an accurate and timely diagnosis is imperative. Benefits of early intervention may include²: shortening hospital stay, decreasing the cost of unnecessary tests, targeting effective treatment, preventing secondary infection and the use of unnecessary antibiotics. Several qualitative nucleic acid multiplex diagnostic instruments have been developed to improve diagnostic methods. Montefiore Medical Center's current method of detection is the use of the xTAG RVP Fast Assay (Luminex). More efficient and accurate platforms are currently available. A retrospective study, evaluating the newer platforms, was conducted utilizing specimens collected from patients with upper and lower respiratory tract infections from the 2013-2014 influenza season. The samples were obtained from nasopharyngeal swabs that were stored at -70C. The two instruments considered were the eSensor (GenMark) and the FilmArray RP (BioFire). 328 stored samples were previously tested on the xTAG RVP, and eSensor, and then 60 samples were pulled at random and tested on the FilmArray RP.

Three hundred twenty-eight samples were run on the xTAG RVP and eSensor. Of these samples, fourteen were excluded from analysis because of the absence of coronavirus on the xTAG RVP panel. The samples that matched and the samples that were discordant are shown on the graph (Figure 1).

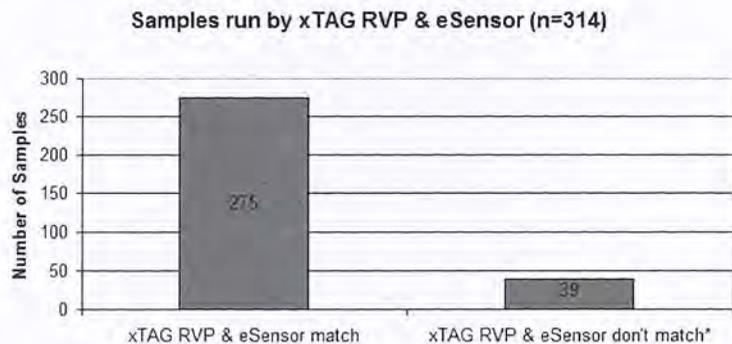


Figure 1. Samples run on the xTAG RVP and eSensor

Samples run by xTAG RVP & FilmArray RP (n=48)

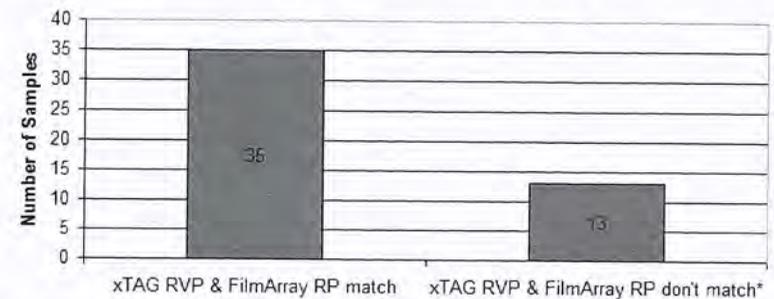


Figure 2. Samples run on the xTAG and FilmArray RP

Out of the 328 samples, 60 samples were pulled at random and were ran on the FilmArray. Out of the 60 samples, 14 samples were excluded from analysis because those 14 samples tested positive for coronavirus. The samples that matched and the samples that were discordant are shown on the graph (Figure 2).

23 samples were tested for influenza B by any methods. 12 of those samples were tested on all three instruments. xTAG RVP tested positive for 5/12, eSensor tested positive for 12/12 and the FilmArray tested positive for 4/12. Due to the discordance, the 7 samples were also tested in tissue culture. These 7 samples were the ones that the eSensor tested positive but the xTAG RVP and the FilmArray both tested negative. Samples placed into tissue culture were negative for influenza B.

In summary, while both the eSensor and FilmArray detected more targets than the xTAG RVP, the benefit to clinical outcomes is currently being explored. The inability for the xTAG RVP to diagnosis certain targets, specifically for coronavirus, may be critical when evaluating the platforms and further analysis is needed. Based on this preliminary study, it appeared as if the eSensor assay was more sensitive than the FilmArray, which was substantiated by the eSensor's lower limit of detection for the analytes. The eSensor includes a full extraction method while the extraction process of the FilmArray is shortened, which may explain the increased sensitivity of the eSensor. However, this will be validated in a larger sample size. Both the eSensor and FilmArray have a larger target panel, shorter run time, and yielded results more quickly than the xTAG RVP.

Works Cited

1. "Respiratory Syncytial Virus (RSV)." *Respiratory Syncytial Virus Definition*. N.p., n.d. Web. 01 Aug. 2014. <<http://www.mayoclinic.org/>>.
2. Loeffelholz MJ, Pong DL, Pyles RB, et al. Comparison of the FilmArray Respiratory Panel and Prodesse Real-Time PCR Assays for Detection of Respiratory Pathogens. *J. Clin Microbiol.* 2011;49(12):4083-4088.

Defining the Mechanism Through Which Obatoclax Kills Thyroid Cancer Cells

Bracha Robinson¹, Devora Champa², Antonio Di Cristofano²

¹Stern College for Women, Yeshiva University, New York, NY; ²Department of Developmental and Molecular Biology, Albert Einstein College of Medicine, Bronx, NY

Poorly Differentiated Thyroid Carcinomas are aggressive tumors that are often untreatable and fatal. Obatoclax, an anti-cancer drug, suppresses these tumors, but its mechanism of action remains unclear. Since Obatoclax was designed as an inhibitor of anti-apoptotic Bcl2 family members, apoptosis is one possible route to cell death. This may be determined through Mcl1 inhibition, since Mcl1 is an anti-apoptotic protein consistently overexpressed in thyroid carcinomas. Alternatively, Obatoclax may cause cell death through modulation of autophagy. ATG5 is a protein that is necessary for autophagy to occur, and suppression of ATG5 may prevent Obatoclax from effecting tumor suppression. Additionally, Obatoclax may cause cell death by inducing lysosome degradation. By altering lysosomal acidity with Bafilomycin, we can determine whether Obatoclax acts through degradation of the lysosomes.

To silence target proteins (Mcl1 or ATG5), plasmid DNA is amplified and purified through maxi preparation. The DNA is packaged into lentiviruses, collected, and the viruses are utilized to infect D445 cancer cells. The DNA encodes for RNA that binds to the target gene of D445 cells, preventing the proteins (Mcl1 or ATG5) from being expressed. Western blots were performed to confirm that the gene was silenced. The modified cells that lack Mcl1 or ATG5 were treated with 500 nM Obatoclax, and the number of cells was quantified at 0 and 24 hours to determine the amount of cell death with and without Obatoclax. To determine the effects of Obatoclax on lysosome degradation, D445 cells were treated with 500 nM of Obatoclax, as well as pre-treatment with 100 nM Bafilomycin at one and four hours prior to treatment. Cells were counted at 0 and 18 hours to determine the effects of the lysosomes on cell death.

Mcl1 was knocked down with a sh-Mcl1 plasmid. These modified cells were treated with Obatoclax (treated) or DMSO (untreated); the parent cell line and empty plasmid cell line were also tested as controls. The data show that there is no difference between sh-Mcl1 cells and the controls, meaning that Obatoclax is able to cause cell death even without Mcl1. Therefore, Mcl1 is not integral to Obatoclax's pathway. To test whether Obatoclax acts through lysosome degradation, D445 cancer cells were treated with both Bafilomycin and Obatoclax. The data show that there is a partial rescue from Obatoclax induced cell death when cells are treated with Bafilomycin, which indicates that lysosomal de-acidification hampers Obatoclax from killing the cancer

cells. The data from the ATG5 experiments indicate that the silencing of ATG5 was not effective. Therefore, the role of autophagy cannot be determined from our data.

Obatoclax does not utilize the anti-apoptotic factor, Mcl1, to kill thyroid tumor cells. However, our data indicates that the lysosomes are involved in Obatoclax's pathway. This suggests that the lysosomes may be therapeutic targets for aggressive thyroid tumors and should be studied further.

Studies in Context Effect Using Eye Trackers and Tests on TBI Patients

Sarah R. Robinson, Eli Vakil, Ayala Bloch, Shiri Schonbach Medina, Ohr Aviv, Haggar Cohen

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

Memory is a mechanism whose purpose is to perceive information, store it and re-use it as necessary, whether consciously or not, so one can cognitively process information which is no longer available to the sensory system. Prior research has presented numerous models describing various types of memory. Within the field of recognition memory, one such type is Context Memory – memory for the information peripheral to the target of interest. Research in context memory explores “Context Effect(CE),” the enhanced memory store for targets presented in the identical background from the initial viewing stage. For example, the target is the face and the scene is context (fig.1). Another example is where the target is a face and the hat is context (fig.2). Though it is a well-documented, CE in recognition memory is somewhat of an evanescent phenomenon – therefore motivating research on the mechanisms behind the binding of a target and context, which conditions motivate the arousal of a CE, and various models proposing the multifactorial elements underscoring the creation, maintenance, and retrieval of context memories.

The Vakil lab aims to study the cognitive relationship between context memory and eye movements by using an SMI Eye Tracker to records participant’s saccadic eye movements. This tool is used in a wide array of contexts; some use it for medical research or diagnostics, while others use it for market research. The Vakil lab uses it to test the presence of implicit learning of a sequence, to measure the participant’s focus (or lack thereof), and the sequence of focused areas.

For example, I was involved in running statistical analyses on an experiment where elderly and young participants visually followed and hit a correlated keyboard key upon seeing a black dot as it sporadically appeared in 4 zones on a computer screen. Unbeknownst to the participants, there was a cyclical sequence governing the transition between the cues – thus making the responses predictable. In analyzing the motor response (from hitting the keyboard key) and the saccadic movements (recorded in the Eye Tracker), results indicated that elderly patients had significantly longer motor responses yet had identical saccadic responses to the stimuli. This therefore indicated that elderly participants, like the young participants, were able to learn the implicit sequence of dots – even if their motor reflexes were unable to communicate that. Thus using an Eye Tracker is very helpful in many experiments because it provides data beyond the participant’s behavioral output. Another study in the Vakil lab presented with faces (the target)

wearing varying types of hats (the context) and an Eye Tracker recorded each saccadic eye movement throughout the learning and testing stages. This research is important because it is possible to gauge the minimum number of saccadic movements to the context in order to achieve a Context Effect.

Lastly, the lab specializes in treatments for patients who suffer from Traumatic Brain Injury (TBI). The lab tests various forms of experimental therapies and experiments on the patients in attempt to enhance their Working Memory and to discern whether results in CE experiments vary between healthy and TBI patients. Throughout the summer, I interacted with such patients in Beit Levenshtern, Rana’ana, and The Rehabilitation Center for Veterans after TBI, Yafo.

Effects of Ethanol on Alcohol Dehydrogenase Deficient (-) and Wild Type (+) Strains of *Drosophila melanogaster*

Emily Rosenblatt and Kate Shapiro

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

The fruit fly, *Drosophila melanogaster*, has been used as a model organism for various genetic studies. Fruit flies grown in the laboratory are fed an artificial diet of specialized formulas. Indigenous fruit flies feed on various fermented fruits and other plant materials. During the fermentation process, toxic alcohols such as ethanol, are released into the environment and hinder growth of other organisms, but not of fruit flies. *D. melanogaster* has developed enzymes that degrade alcohols, thus raising their alcohol tolerance. Alcohol dehydrogenase (ADH), an enzyme encoded by a gene on chromosome #2, metabolizes nearly all of the ingested alcohol. In ADH-deficient (-) flies, the alcohol accumulates causing intoxication and subsequent death.

This experiment observed the difference in alcohol tolerance between two strains of adult *D. melanogaster*; the wild type strain that displays normal ADH activity and a mutant strain that displays ADH deficiency. The study also observed the F₁ offspring for developmental abnormalities.

Wild type and ADH (-) fruit flies were cultured in plastic vials each containing 4.25 g of Formula 4-24 Instant Medium (Carolina Biological Supply Company). The media was hydrated with 13 mL of varying concentrations of Samuel Adams Boston Lager beer, which has a 4.9% alcohol content. Each strain of *D. melanogaster* was cultured in media hydrated with 0% (water), 25%, 50%, and 100% beer. Three culture vials were prepared for each concentration. Each vial received between 15 and 25 non-sexed adult flies. To measure mortality differences between ADH (-) and wild type flies, the flies were observed at specific time intervals over the course of 48 hrs. The number of dead flies observed at each time interval was recorded as a percentage of the total number of flies in each vial. Over the course of the following 3 weeks, wild type flies cultured in alcohol-amended media were observed for mortality in the P generation, as well as for developmental delays and deformities in the F₁ generation. Developmental delays were assessed by recording the lag time in the development of larvae, pupae, and adults compared to controls. The presence of deformities was recorded by qualitative observation of wing deformities and poor motor skills in adult flies of the F₁ generation.

ADH (-) flies had a significantly higher mortality rate across all concentrations of beer as compared to the wild type strain (Fig. 1). At a concentration of 100% beer more than half of the ADH (-) flies died by 10 hrs. Additionally, at a concentration of 100% beer, the peak number of

deaths for ADH (-) flies was recorded at 48 hrs, compared to the wild type flies which exhibited a mortality rate of only 55% by day 7 (Fig. 2). The results confirmed a lack of ethanol metabolism by the ADH (-) flies. In addition, in the wild type strain, prolonged exposure to beer at all concentrations tested resulted in death.

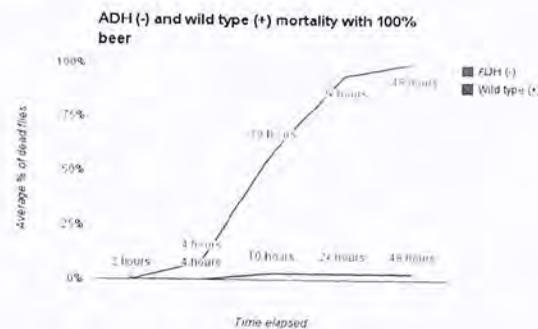


Figure 1. Mortality rate over 48-hr period of ADH (-) and wild type (+) *D. melanogaster* cultured in media hydrated with 100% beer.

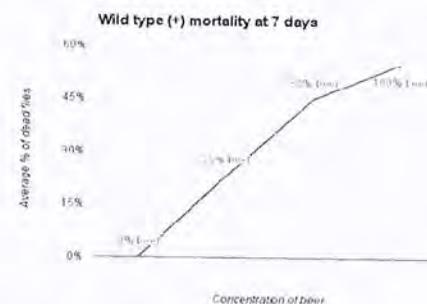


Figure 2. Mortality of wild type *D. melanogaster* after a 7-day exposure in media hydrated with varying concentrations of beer.

The wild type strain of *D. melanogaster* was observed over a 3-week exposure to beer to determine developmental abnormalities in the F₁ generation. Significantly fewer offspring were noted in media hydrated with 50% and 100% beer. In addition, all concentrations tested were associated with slower development through the larval and pupal stages of the life cycle compared to controls. At concentrations of 50% and 100% beer, many of the F₁ surviving offspring that developed into the adult stage displayed poor motor skills and wing deformities, such as disfigurement or absence of wings. These studies with *D. melanogaster* serve as a model system for human fetal alcohol syndrome.

Creation of Double Mutant Cells for Nek3 and Nek5 Kinases by CRISPR/Cas9 Method and the Identification of Nek5 in the Brain and Lung

Michal Schechter¹, Sivan Cohen², Professor Benny Motro²

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

Transition from one cell cycle phase to another occurs in an orderly fashion and is regulated by multiple evolutionary conserved proteins. In our lab, we researched the Nek kinase family, which is known to be involved in the transitions between the cell cycle phases. The mammalian NIMA-related kinases (NRK's) genes, which are designated as Nek1-11, encode for evolutionarily conserved serine/threonine kinases, structurally related to the fungal mitotic regulator, NIMA. As implied by its name (Never In Mitosis A), the catalytic activity of *Aspergillus nidulans* NIMA is indispensable for mitotic entrance. In conditional absence of NIMA activity, fungal cells arrest in G2, exhibiting interphase microtubules and uncondensed chromosomes. Overexpression of NIMA induces a mitosis-like phenotype, including premature chromatin condensation and abnormal mitotic spindles.

One sentence about the functions. Several mammalian Nek kinases (including Nek2, 6, 7, and 9) have shown to be critical for the cell cycle and the centrosome cycle. However, the functions of the other mammalian Nek kinases are less obvious. The catalytic domains of Nek1, Nek3, Nek5 and are highly homologous. Therefore, they are sub-grouped into the same NIMA-related kinase sub-family. Nek1 has shown to be critical for primary cilium genesis, and mutants for Nek1 exhibit dwarfism, sterility and polycystic kidney disease. Nek3 is expressed in the brain, and is involved in microtubule dynamics. Very little is known about Nek5, so our lab created knockout mice to nek5. There was no apparent phenotype for these mice, they were healthy and fertile, and did not exhibit developmental problems.

Due to the possibility that Nek3 had compensated for the absence of Nek5 in the mutant mice, the first goal of my project was to create a double mutant for Nek3 and Nek5 in cells. We attempted to create this double mutant by using the CRISPR/Cas9 system. CRISPR is a new method which is based on the Cas9 system in bacteria. The CRISPR/Cas9 system is usually used for targeted gene editing. We planned and constructed unique genomic sequences for Nek3 and Nek5 (designated single guide RNA-sgRNA), which possessed recognition sites for endonuclease Cas9. When the Cas9 protein recognizes the sgRNA, Nek3 and Nek5 are cut out and the double mutation is thereby created. Based on the phenotype of Nek1, we expect to see an abnormal phenotype in the cell cycle or in the DNA damage response of the double mutants for Nek3 and Nek5.

Since the mice mutant for Nek5 did not have an obvious abnormal phenotype, our lab also checked to see in which specific organs nek5 is expressed. Based on previous Northern blotting analysis, we concluded that Nek5 is mainly concentrated in the brain and lung. In order to identify the exact areas expressing Nek5, we took advantage of the lacZ which the lab had inserted into Nek5 locus in the knockout mice. The lacZ was inserted downstream of the endogenous Nek5 promoter, thus lacZ staining is expected in areas where Nek5 is expressed. We were able to demonstrate that lacZ staining (and thereby Nek5) is specific to the arterioles in the lung, while no expression could be seen in the alveoli or other structures in the lung. As the arterioles are ciliated, it may be speculated that Nek5 is involved in cilia genesis (as has been shown for Nek1).

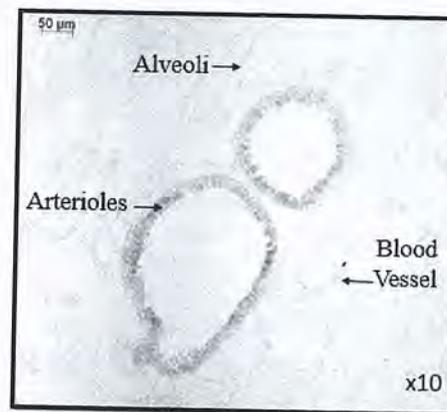


Figure 1. Beta-galactosidase staining of a lung tissue from a heterozygote Nek5 mouse (x10).

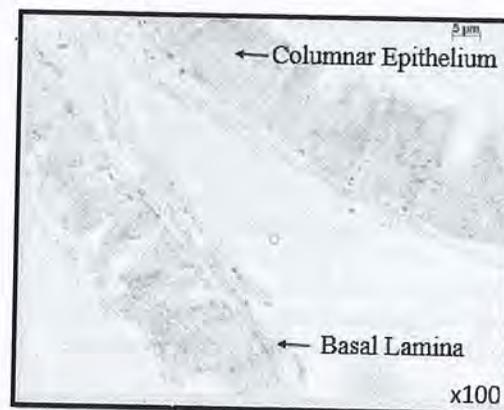


Figure 2. Beta-galactosidase staining of a lung tissue from a heterozygote Nek5 mouse (x100).

Faces in the Face of Death: Effects of Mortality Salience on Electrophysiological Perception of Facial Expressions

Shonna Schneider¹ and Dr. David Anaki²

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

The focus of our experiment was to systematically examine the influence of facial expressions on neuronal activity in the context of mortality salience, which was measured using ERP (Event-Related Potential). In the framework of the Terror Management Theory, anxiety was associated with an existential threat caused by facial expressions and recognition when presented with mortality salience conditions. However, there are contradictions in the literature about the nature of this relationship, which may be due to the various stages of awareness of death (proximal vs. distal). In this study, participants were proximally presented with mortality salience.

We measured electrophysiological components activated in response to threatening (fear / anger), negative (sadness / disgust), positive (happy) and neutral faces. Participants were given either the pain condition, which entails writing about a painful visit to the dentist, while seeing the word *pain* flashed between each facial expression, or the death condition, where participants had to write about what they expect their own death to be like, while the word *death* flashed between each facial expression.

In the results (Figures 1-4) we found significant differences in the P1 and N170 components between the mortality salience condition and the pain condition. In the P1 component, which measures arousal, there is a significant difference between the pain and mortality salience conditions. Participants in the mortality salience condition showed higher arousal to the various facial expressions. Additionally, we discovered a strong incongruence in the N170 (the facial recognition component) between the right and left sides of the brain. For the pain condition, there was a much higher electrophysiological response on the right side of the brain. This finding is congruent with previous research that demonstrates higher arousal in the right side of the brain in the context of facial expressions and emotions. Fascinatingly, in the death salience condition, recognition in the left side of the brain increased tremendously, while it deteriorated in the right side. This experiment suggests that the amplitude of the N170 will be higher in the left side of the brain when presented with facial expressions in the context of mortality salience.

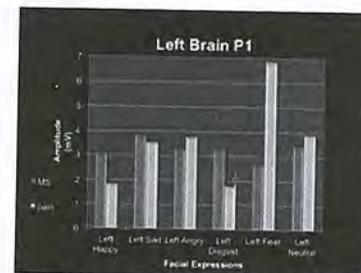


Figure 1. Average of P1 Recordings in the Left Brain

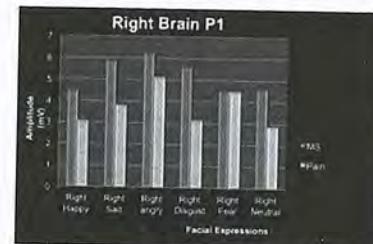


Figure 2. Average of P1 Recordings in the Right Brain

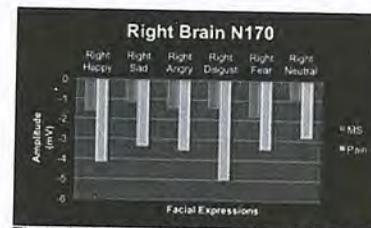


Figure 3. Average of N170 Recordings in the Right Brain

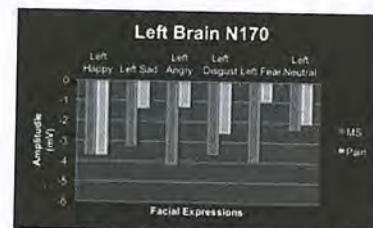


Figure 4. Average of N170 Recordings in the Left Brain

The Role of Glycosylation in the Gamma-Glutamyltranspeptidase I Enzyme

Avital Shulman and Chaya Rapp

Department of Chemistry and Biochemistry, Stern College, Yeshiva University, New York, NY

Glycosylation of proteins is a post-translational modification known to affect protein conformation and folding, as well as distribution, stability and activity. In N-linked glycosylation a sugar group is attached to the amide nitrogen of an Asparagine (Asn) residue.

Gamma-Glutamyltranspeptidase I (GGT-I) is a conserved enzyme known to play a role in maintaining cysteine levels in the body and in regulating intracellular redox status. Additionally, its overexpression and mislocalization have been implicated in cancer as well as other diseases. Seven N-glycosylation sites have been identified on human GGT-I. Although studies have shown that N-glycosylation is not required for the activity of the mature enzyme, N-glycosylation on a single site, Asn-95, is required for the autocatalytic cleavage event that produces the heterodimeric enzyme out of a single chain propeptide.

In this project, molecular dynamics simulations were used to investigate the role of glycosylation in the activation of the GGT-I enzyme. The crystal structure of GGT-I was used as a starting model and simulations were run on the glycosylated and non-glycosylated structures to assess what changes in structure and dynamics can be associated with the presence of the sugar group.

Our results support a role for glycosylation in the formation of the hydrogen bonds and disulfide bonds that are characteristic of the mature enzyme. Hydrogen bond analyses revealed higher hydrogen bond occupancies between Thr97 and His248 and the sugar group than to the un-glycosylated Asn-95, and the presence of hydrogen bonds to Arg150 to the sugar group only (Table 1). These hydrogen bonds form a link between the end of helix 3 and the turn containing the Asn95 residue, which may help stabilize a conformation needed for the autocatalytic cleavage. A comparison of the torsional motions in the glycosylated and unglycosylated simulations shows differences in helix 3, the turn containing Asn95, and a nearby loop (Figure 1). Divergence in torsional motions is also evident in residues 190 and 201, which are close to the critical Cys192-Cys196 disulfide bond, and sulfur-sulfur distances for both the Cys50-Cys74 and Cys192-Cys196 bonds show the sulfur atoms moving farther apart during the course of the unglycosylated simulation (Figure 2).

Future work will involve generating the structure of the pro-peptide from the experimental structure of the heterodimer and running molecular dynamics

on the pro-peptide to gain further insight into the mechanism of its activation.

Hbonds to Sugar		Hbonds to Asn-95		
Residue	%Occupancy	Residue	%Occupancy	%Occupancy
Th97	23.8		GLC	NO_GLC
His148	17.4	Thr97	32.5	17.2
Arg150	10.9	Thr98	9.2	40.7
		Lys100	24.9	43
		Glu102		7.6
		His148		9.1

Table 1. Hydrogen Bonding to Sugar group and to Asn95 in simulations of Glycosylated (GLC) and Unglycosylated (NO_GLC) GGT-I

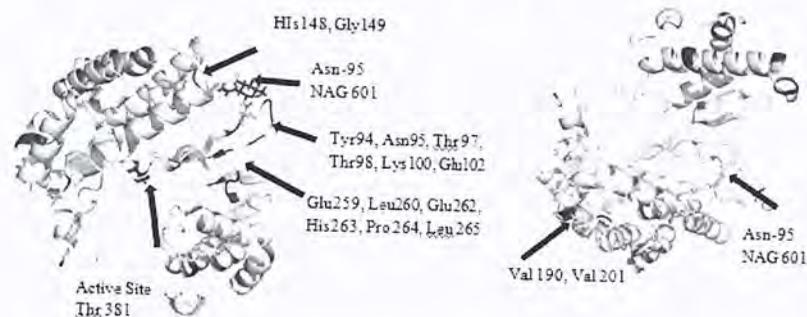


Figure 1. KL divergence analysis shows differences in torsional motions between glycosylated and unglycosylated simulations. Color shows divergence with divergence increasing from blue to green. Left – KL divergence between glycosylated and un-glycosylated simulations highlights divergence in loop containing Asn95, a nearby loop, and in $\alpha 3$ which contains hydrogen bonding residues. GGT-I, chain A, is pictured. Right – KL divergence between glycosylated and unglycosylated simulations highlights divergence near a critical disulfide bond. GGT-I, chain A, is pictured and Cys residues that form disulfide bonds are in yellow.

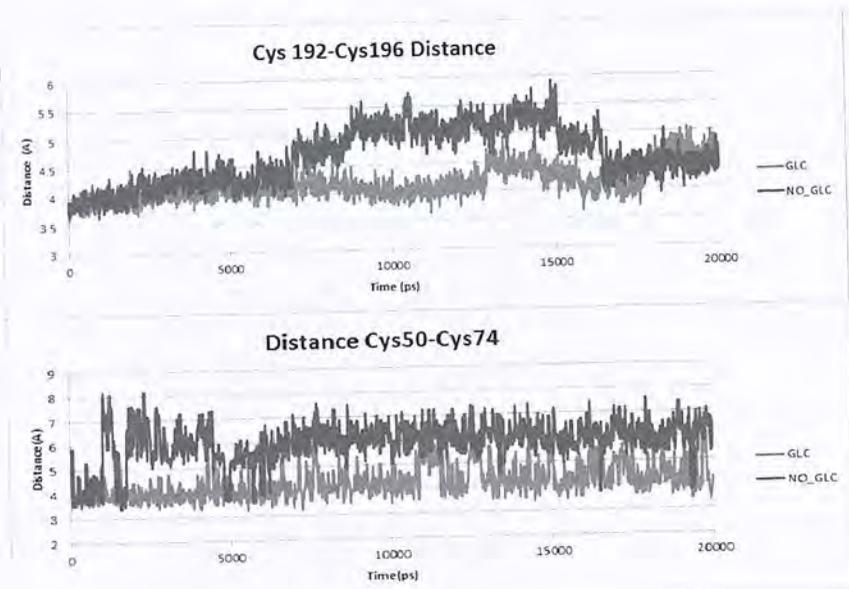


Figure 2. Distance as a function of time, in simulations of glycosylated and unglycosylated GGT-I, for sulfur atoms involved in critical disulfide bonds.

Mutagenic Effects of Monosodium Glutamate Evaluated with the Ames Test; Genotoxic and Cytotoxic Effects Evaluated with the *Allium Cepa* Assay

Anjali Stokes and Kate Shapiro

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

Monosodium glutamate (MSG) is a flavor enhancer commonly added to Chinese food, canned vegetables, soups, and processed meats. Although the Food and Drug Administration (FDA) has classified MSG as a food ingredient that is generally safe, its incorporation into food products remains controversial. Due to inconsistent clinical findings on the effects of MSG, our laboratory was interested in studying its mutagenic effects using the Ames test as well as its genotoxic and cytotoxic effects using the *Allium cepa* assay.

The use of the Ames test is based on the assumption that a substance which is mutagenic to bacteria, may also be a carcinogen to animals, including humans. The ease and low cost of the test make it useful for screening substances in our environment for carcinogenicity. The bacteria used in the test is a strain of *Salmonella typhimurium* that contains a defective gene rendering it incapable of synthesizing the amino acid histidine from the ingredients in the culture medium. However, some mutations, such as this one, can be reversed upon exposure to mutagenic substances. This is referred to as a back mutation in which the gene regains its function. The bacteria expressing the back mutation are able to synthesize histidine and grow on the culture medium.

In our study, minimal agar plates were prepared and inoculated with the histidine-requiring strain of *S. typhimurium*. Sterile paper discs were impregnated with different concentrations of MSG and placed at the center of each plate. This is based upon the diffusion of the test agent from the paper disc into the surrounding agar. The plates were incubated for 7 days at 37° C and observed thereafter for the presence of bacterial colonies around the discs. Progressively increasing the concentration of MSG from 1×10^{-2} M to 1×10^{-1} M yielded no observable colonies on the agar plates. According to our studies, MSG is not a mutagenic substance at the concentrations tested.

The genotoxic and cytotoxic potentials of MSG were subsequently tested using the *A. cepa* assay. *A. cepa*, colloquially known as the pearl onion, is a suitable model system for detecting the genotoxicity and cytotoxicity of various substances. The *Allium* assay is a particularly useful, low cost test that is used extensively in monitoring environmental contaminants, particularly by investigating chromosomal damage in mitotic cells. Mitotic

chromosomes of *A. cepa* are large and few in number and, upon staining, are easily visualized microscopically. The detection of chromosomal abnormalities in *A. cepa*, a eukaryote, after exposure to test agents may indicate the potential harmful effects of those agents on other biological systems, including human beings.

Genotoxicity was studied through observation of aberrations in the mitotic chromosomes after allowing the *Allium* rootlets to grow in solutions amended with varying concentrations of MSG. Solutions of 1×10^{-2} M, 5×10^{-2} M, and 1×10^{-1} M MSG were prepared. After a 48-hr exposure, the rootlets were excised from the bulb and placed in a fixation/hydrolysis solution for 3-5 minutes at 48°C. The fixation/hydrolysis solution both killed the cells and softened the tissue, needed for subsequent cell dissociation and spreading on a microscope slide. The terminal 2 mm tip of the rootlet was isolated with a razor blade, squashed upon a microscope slide, and stained with aceto-orcein. Chromosomal aberrations were viewed microscopically. Cytotoxicity was studied after the rootlets grew for five days in the presence of MSG, and thereafter root lengths were measured for each concentration of MSG tested.

Data showed that a concentration of 1×10^{-2} M MSG produced the most mitotic disturbances including sticky chromosomes and vagrant chromosomes in anaphase (Fig. 1), and failure of the spindle apparatus to form. In addition, the data suggested greater cytotoxicity associated with higher concentrations of MSG, specifically 5×10^{-2} M and 1×10^{-1} M MSG (Table 1).



Figure 1. Sticky chromosomes and vagrant chromosomes in anaphase induced upon exposure to 1×10^{-2} M MSG.

Concentration MSG	Mean root length
0 M (water only)	35 mm
0.01 M	26 mm
0.05 M	7.5 mm
0.1 M	2 mm

Table 1. Mean root length after 5-day exposure to MSG.

Relative Quantification of Induced Pluripotent Stem Cell and Neuronal Markers along Neuronal Differentiation

Alita Teitz¹ and Gilli Moshitzky²

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

Human embryonic stem cells can be differentiated into neurons by growing the cells in culture with retinoic acid or N2 media. The progressive stages of differentiation can be monitored by the presence of cell markers, which are indicators of cellular activity. As such, in our research we followed the progression of neuronal differentiation by using RNA from stem cells at three separate time points post-treatment for quantifying the levels of known stem cell and neuronal markers. We used Nanog and Oct4 as stem cell markers, and for neural markers we employed the progenitor marker Sox2, and the neuronal markers Tuj1, Map2 and Nestin. The process began with extracting RNA from cells treated with RA or N2 to induce their differentiation. We then produced cDNA from this RNA and tested it in RT-PCR with the cell markers. By comparing the resultant Cq values with control genes, we found reduced concentrations of stem cell markers in differentiated compared to undifferentiated stem cells, and likewise, the neuronal markers showed higher concentrations in differentiated compared to undifferentiated stem cells. The quantification of the Cq values using the $2^{-\Delta\Delta CT}$ (Livak) method also showed differences in the cellular expression levels of the marker genes at the three time points. The stem cell and neuronal markers showed a decrease in expression over time, and the neuronal markers showed an increase (Figures 1-4), which indicates that cells were differentiated successfully.

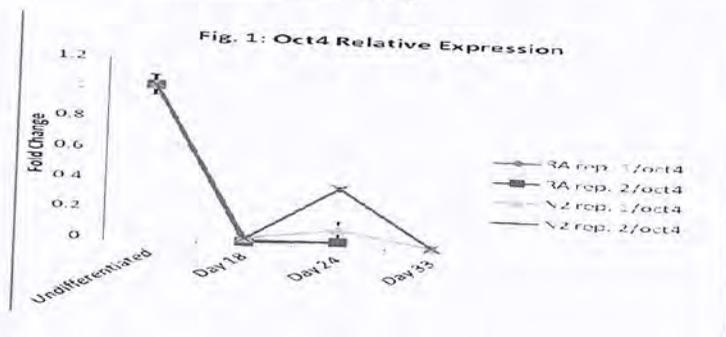


Figure 1. Oct4 Relative Expression in Cells along Differentiation with N2 and RA Media

Production of Biethanol from the Green Algal Species, *Ulva Lactuca*: The Role of Ulvan-degrading Enzymes in a Synthetic Operon

Adina Wakschlag¹, Mariana Klyman², Moran Kopel², Ellie Foran², Gal Yerushalmi², Ehud Banin²

¹Stern College for Women, Yeshiva University, New York, NY; ²Institute of Nanotechnology and Advanced Materials, The Mina and Everard Goodman Faculty of Life Sciences, Bar Ilan University, Ramat Gan, Israel

Ulva lactuca is a species of green seaweed favorable from many standpoints for the production of ethanol fuel via the conversion of its polysaccharides - namely, ulvan, comprised of rhamnose, glucuronic acid, xylose, and glucose* - into ethanol. In an attempt to bioengineer a microorganism that will carry out this entire conversion process, five genes coding for ulvan-degrading enzymes of native ulvan-degrading bacteria were isolated, genetically sequenced, and quantitatively characterized as collectively efficient in ulvan sacchrification. In this research effort, the first of several ulvan-degrading enzymes** was constructed into what will be a synthetic operon that will facilitate the sacchrification of ulvan. The subsequent ulvan monomers are to be fermented into ethanol through modified metabolic pathways of the same organism, *Escherichia coli* KO11.

In order to carry out the most efficient sacchrification of ulvan, we have employed a synthetic operon system developed by the laboratory of Ron Milo at the Weizmann Institute of Science, Rehovot, Israel. This project aims to create a library of synthetic operon permutations, consisting of six different ribosome binding sites (RBSs A-F) and five separate genes for specific ulvan-degrading enzymes necessary for complete ulvan degradation. The purpose of the utilization of varied RBSs is to fine-tune the synthetic operon by pinpointing the appropriate expression levels of each enzyme. Each RBS demonstrates unique affinity to the ribosome, corresponding to the distinct level of the subsequent gene's expression. At the end of the synthesis process, the operon with the combination of RBSs that yields the most effective ulvan-degradation will be selected.

During the initial assembly of the synthetic operon, the resistance cassette for the antibiotic, chloramphenicol (Cm^R), is sewn onto the genetic inserts and ligated to temporary host plasmids pNIV A-F (each pNIV accommodating a unique RBS) in order to allow for selection of plasmids containing the gene of interest. pNIV plasmids and genes with Cm^R are restricted and ligated to one another, one gene at a time (utilizing only one Cm^R), until all five genes are incorporated into a single insert. The end result is a library of 6^5 combinations of the complete operon. The synthetic operon in its numerous forms is then transferred out of the pNIV plasmids and into pTAC, a plasmid that facilitates better gene expression than pNIV. Subsequent biochemical assays will determine the most efficient ulvan-

Fig. 2: Sox2 Relative Expression

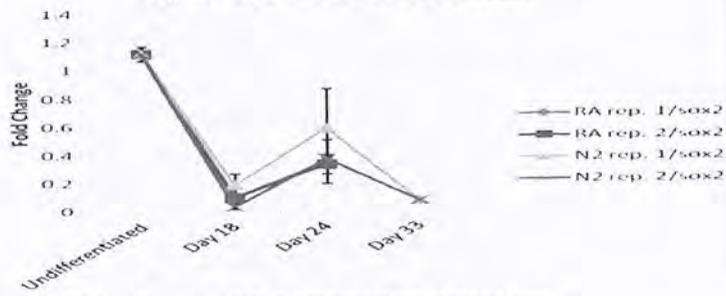


Figure 2, Sox2 Relative Expression in Cells along Differentiation in N2 and RA Media

Fig. 3: Nanog Relative Expression



Figure 3, Nanog Relative Expression in Cells along Differentiation in N2 and RA Media

Fig. 4: Map2 Relative Expression

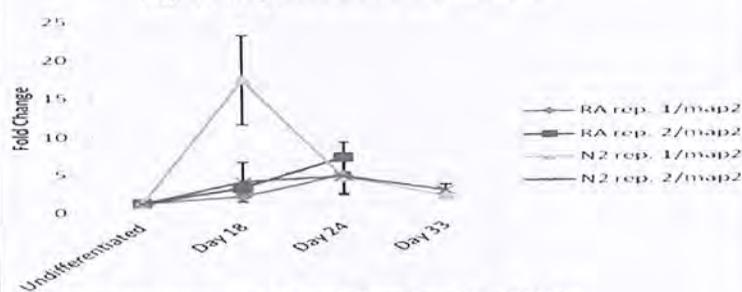


Figure 4, Map2 Relative Expression in Cells along Differentiation in N2 and RA Media

degrading operon permutation, and the plasmid containing that sequence will be transformed into the final organism, *E. coli* KO11. Presently, the research effort at hand has successfully integrated Gene 1 of the operon into pNIV A-F plasmids, setting the stage for further synthesis of the operon.

*Ulvan's sugar sequence is presented (in Percival & McDowell, 1967) as follows:
GlcA(1→4)Rha sulfate(1→4)GlcA(1→3)Xyl(1→4)Rha sulfate(1→3)Glc(1→4)Xyl

**Names of genes, enzymes, and native ulvan-degrading bacterial strains cannot be disclosed at this time due to patent issues. Genes are referred to using arbitrary labels ("Genes 1-5").

Pictorial IAT as a Measurement of Implicit Social Anxiety

Naomi Wakschlag¹, Tamar Annenberg¹, Hadar Keshet², Professor Eva Gilboa-Schechtman²

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

The self is a multifaceted structure that is proposed to function in both implicit and explicit modes. Implicit self-evaluation can be measured with the Implicit Association Task (IAT) (Greenwald & Farnham, 2000), and in this way can be used as a tool to indicate social anxiety. Trower and Gilbert (1989) theorized that individuals with social anxiety interpret social interactions as determinants of status in a dominance-submission social hierarchy, viewing themselves as submissive and others as dominant.

The current study examines self-evaluation as it relates to Trower and Gilbert's (1989) theory of social anxiety. We used a single-category self-evaluation IAT to compare associations of the attributes of self and not-self with the attribute of dominance. Slabbinck, De Houwer, and Van Kenhove (2011) demonstrated that since the source of implicit associations is pre-verbal experience, a pictorial IAT can be used as a valid measure of such associations. Accordingly, in the current study we presented our dominant stimuli in the form of pictures of dominant individuals, whereas thus far self IATs have presented stimuli only in the form of words.

The first aim of our study was to determine whether a self-evaluation IAT with some stimuli presented as pictures would yield results similar to those of non-pictorial measures of implicit self-evaluation. Previous studies measuring implicit self-evaluation have established that most individuals, in any sample, positively associate concepts relating to the self (Greenwald & Banaji, 1995). Therefore, we set out to determine whether our pictorial dominance self IAT would result in similar self-associations. In addition, past studies have examined the correlation between explicit and implicit self-evaluations. In contrast to implicit measures, explicit measures are often influenced by demand characteristics. Positive correlations between explicit and implicit self-evaluations have been found, but have been weak, possibly as a result of the influences on responses to explicit self-report measures (Greenwald & Farnham, 2000). The second aim of the current study was to look for correlations between explicit and implicit self-evaluations, and to compare our findings to the results of previous studies.

In our study, we measured explicit and implicit self-evaluations in eleven undergraduate students. We used the Rosenberg Self-Esteem Scale to measure explicit self-esteem and a pictorial IAT to measure implicit self-concept as it relates to dominance. In the IAT, the participants were presented with stimuli that were related to the attributes of self, not-self, or dominant. The participant was asked to sort each stimulus into the

appropriate attribute by pressing specified keys on a keyboard. If a participant strongly associated himself with dominance, he would more quickly sort the self and dominant stimuli together. If a participant strongly associated others with dominance, he would more quickly sort the not-self and dominant stimuli together. This comparatively stronger association between others and dominance would indicate a lower level of implicit self-evaluation.

Analysis of the data revealed that, except for one low explicit self-evaluation score, all explicit self-evaluation scores fell within the normal range, and that six of the participants had positive implicit self-evaluation scores. No overall correlations were found between explicit and implicit self-evaluations. These results show that our pictorial IAT was not fully consistent with the results of previous studies. Based on the previous studies on implicit self-evaluation, we expected to find all positive implicit self-evaluation scores. While six of the scores were positive, indicating some consistency with previous studies, five of the scores were negative. This is particularly surprising since all but one of our participants reported normal explicit self-evaluation. Because our results indicated that our pictorial IAT was not fully consistent with other measures of implicit self-evaluation, we could not arrive at any conclusions regarding the correlation between explicit and implicit self-evaluations.

Limitations of the current study include small sample size and use of only one explicit self-evaluation measure. Future research could explore the validity of a pictorial IAT, using a larger sample size and multiple measures of explicit self-evaluation. Future research could also compare results of a pictorial IAT with results of a validated word IAT.

Greenwald, A.G., & Banaji, M.R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, 102(1), 4–27.

Greenwald, A.G., & Farnham, S.D. (2000). Using the Implicit Association Test to measure self-esteem and self-concept. *Journal of Personality and Social Psychology*, 79(6), 1022–1038.

Slabbinck, H., De Houwer, J. and Van Kenhove, P. (2011). A pictorial attitude IAT as a measure of implicit motives. *European Journal of Personality*, 25(1), 76–86.

Trower, P., & Gilbert, P. (1989). New theoretical conceptions of social anxiety and social phobia. *Clinical Psychology Review*, 9(1), 19–35.

Mathematical Model for NK Cell Development in the Liver

Tamar Wasserman¹, Nissim Pinhas², Michal Simon², Professor Ramit Mehr²

¹Stem College for Women, Yeshiva University, New York, NY; ²The Mina and Everard Goodman Faculty of Life Sciences, Bar Ilan University, Ramat Gan, Israel

Natural Killer Cells are part of the innate immune system, the "first line of defense" of the body against pathogens, including bacteria, viruses, and cancer cells. NK cells are particularly crucial in the liver, the organ which cleans out the blood flowing through the body, including the blood coming from the digestive system. This study investigated the development of NK cells in the liver.

There are four stages of development in Natural Killer Cells, and these stages are defined by whether or not the cell has one, both, or neither of two receptors (CD27 or Mac-1) on its membrane: $CD27^+Mac-1^- \rightarrow CD27^+Mac-1^+ \rightarrow CD27^-Mac-1^+$. These two receptors are specifically for NK cells in mice; humans have different receptors, including CD56, which can also have different levels of expression ($CD56^{bright}$ and $CD56^{dim}$). The goal of the experiment was to analyze the dynamics of development of NK cells in the liver. Eventually, this should lead to conclusions being drawn about NK cells in humans. By using a mathematical model, we were able to find the rates at which the NK cells at each of the four stages enter the liver, proliferate, transition to the next developmental stage, and die or exit the liver; we also found the carrying capacity for each population in the liver.

The data for the mathematical modeling was received from Eric Vivier's lab in France. The lab depleted NK cells in a number of mice, and harvested NK liver cells from a few mice every few days, a few hours after injecting BrdU (to track proliferation rates). The total number of cells and the fraction of BrdU labeled cells were measured for each mouse. These measurements were used for the modeling.

From the results of the mathematical modeling, we were able to conclude that NK cells at the later stages of development have longer residence times. Cells in Stage 4 have much longer residence times than the cells in the earlier stages because the Stage 4 cells are mature and in their fully-functioning state. Therefore, they remain in the liver in this stage for longer, in order to function as fully-developed NK cells.

We also found that Stages 3 and 4 have the highest carrying capacities, possibly because these are the cells that are most needed in the liver, which is a more mature lymphoid organ (in comparison to the bone marrow). The liver therefore may "reserve" more space for these mature cells.

Lastly, we found that Stage 4 has the highest rate of influx of NK cells from outside the liver. As mentioned above, most cells enter the liver at this mature stage (as opposed to at earlier stages of development) because the

liver is a mature organ and requires these cells for functioning. It is likely that it is more efficient for the cells to mature in the bone marrow and then migrate to the liver, instead of entering the liver at stage one and maturing in the liver. (In total, it takes an NK cell approximately 155 days to advance through the first 3 stages in the bone marrow, whereas it takes 348 days in the liver.)

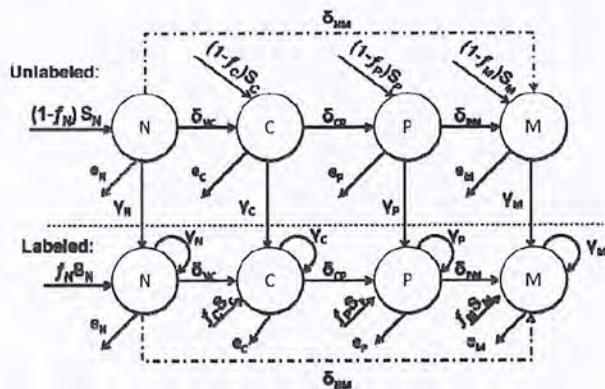


Figure 1. Model scheme. BrdU, a stain which is incorporated into dividing cells, was injected into mice after 2 hours and after 6 hours (to measure rate of proliferation of the cells). Therefore, the model includes both labeled and unlabeled cells. Parameters used: f =fraction of labeled cells, S =outside source of cells, δ =rate of transition (from one stage of development to another), γ =rate of proliferation, e =rate of death/exit.

Nitric Oxide (NO) Donor SNAP Effect on Appetitive Behaviors in a Rat Model

Lauren Weiss¹, Professor Abraham J. Susswein², Professor Aron Weller²,
Noa Hazut²

¹Stern College for Women, Yeshiva University, New York, NY; ²The Leslie and Susan Gonda (Goldschmied) Multidisciplinary Brain Research Center, Bar Ilan University, Ramat Gan, Israel

Nitric oxide (NO) is a unique second messenger not only because it is a free radical but also because it is a gaseous, inorganic, uncharged diatomic molecule that is so structurally simple that it cannot conceivably be recognized by proteins through the weak intermolecular forces that typify the recognition of other second messengers. Since NO is an uncharged and almost non polar molecule, it is transported by simple diffusion.

There are three types of nitric oxide synthases (NOS). They are complex proteins found constitutively in two isoforms, neuronal (nNOS) and endothelial (eNOS). The third, inducible, type (iNOS) is rarely present normally but can be expressed in numerous cell types (prototypically in macrophages, mainly in microglia in the CNS) when subjected to immunological challenge.

In mammals, NO is mainly produced from the oxidation of the amino acid L-arginine in a highly controlled process catalyzed by specialized NOS. A number of studies regarding energy intake and neuropeptides has shown that NO is involved in the regulation of food intake in several species such as: mice, rats, chickens and more.

The preliminary experiments on nitrergic regulation of feeding in rats were designed to imitate earlier data on nitrergic control of *Aplysia* feeding. The effects of the NO donor S-Nitroso-N-acetyl-penicillamine (SNAP) and of the NO precursor L-arginine on *Aplysia* feeding were previously examined in Professor Abraham J. Susswein's lab. In hungry animals, injecting SNAP had minimal effects on feeding behavior. However, when food was removed from animals after they have been satiated (steady state), it induced a gradual transition to eating large meals when food will be available. Treatment with the NO donor was one of several stimuli that preserved the steady-state, thereby inhibiting feeding. This experiment suggests that post-ingestion NO formation derived from food eaten during snacks could be a post-ingestion stimulus that preserves the steady-state inhibition of feeding. Susswein's lab speculated that increased L-arginine and extracellular NO are weak inhibitors of feeding.

These studies indicate that L-arginine and NO are weak inhibitors of feeding and are most effective in conditions of relatively low drive to eat, such as when animals are in the steady-state, and eat snacks rather than large meals.

We therefore devised an experimental situation in which rats have a relatively low drive to eat, but some eating occurs.

Moreover, previous studies in mammals reported that NO is related to obesity, insulin resistance and more. However, not any of these studies focused on the influence of background NO release, after satiation.

Our aim is to examine the hypothesis that NO, and its precursor L-arginine, have a role in regulating feeding, and could therefore have a role in either the reason of feeding disorders, or in their treatment. The hypothesis is based on the idea that metabolites can act as post-ingestive or homeostatic signals that affect subsequent feeding behavior. In some cases metabolites are precursors of neurotransmitters, and affect feeding and other behaviors by regulating transmitter synthesis and release. We propose that the NO donor SNAP will inhibit feeding via an increase in NO.

The experiment was performed in the morning hours between 9:30am-12:00 pm on young adult male Wistar rats, 70-90-days-old, (mean weight: 250-300 g, respectively). We gave the rats 60% of their regular consumption of chow night before the experiment. In the morning of the experiment the rats were given 20 g. of chow for half an hour. The injection of SNAP was given intraperitoneally (i.p), and given to all subjects in a counterbalanced design of different dosages of: 0 (saline), and 10 mg/kg. Next, the rats were given 20 g. of chow, we monitored food consumption for one hour and at the end of the hour we weighed the food to check the influence of SNAP on food consumption.

Treatment with SNAP led to a decrease in grams of chow eaten (see Figure A) and a decrease in the number of meals eaten within one hour (see Figure B) compared to the control group which was treated with saline (* $p < 0.05$).

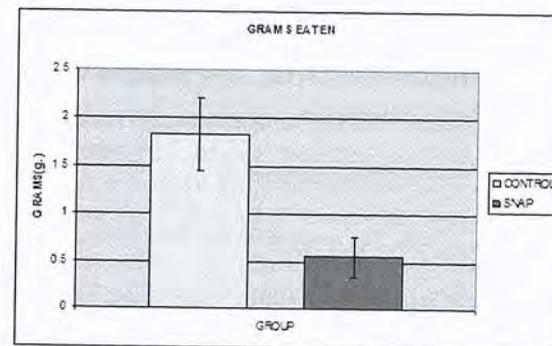


Figure A. Grams of chow eaten by control group as opposed to the rats injected with SNAP.

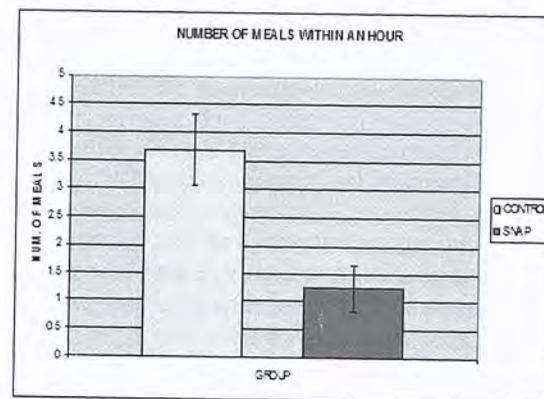


Figure B. Number of meals eaten within an hour by control group compared to the rats injected with SNAP.

A Promising Novel Approach to the Diagnosis and Monitoring of Corpus Callosum Atrophy in Patients with Multiple Sclerosis

Jennifer Wiseman and Joshua Bacon

Department of Psychology, Stern College, Yeshiva University, New York, NY

Cognitive impairment is found in 45%-70% of multiple sclerosis (MS) cases [1] and is thought to be the result of focal demyelination in deep white matter and diffuse brain tissue damage. Autopsy and Magnetic Resonance Imaging (MRI) studies show that the corpus callosum (CC) is a common target for MS-lesions, which may impair cognitive functions that utilize interhemispheric pathways. CC damage is presently assessed by MRI; however, cognitive decline can manifest much earlier than physical symptoms. Additionally, MS symptoms do not always show MRI atrophy.

At present, the available neuropsychological tests assess specific domains of cognition, such as attention and memory, but they do not target specific cognitive processes that depend critically on CC pathways. The purpose of our research is to develop specific neuropsychological tests that can isolate damage associated with cognitive dysfunction specifically related to cross-hemisphere processing.

One of these tests, The Divided Visual Field Paradigm, measures performance of the verbal recognition of words presented to the left and right visual hemifields. Words presented on the left visual field (LVF) are generally processed by the right hemisphere (RH) and vice versa. Since language function is primarily lateralized in the left hemisphere, the words presented to the RVF are processed in the appropriate hemisphere for speech processing. Words located in the LVF, however, must first reach the RH and then cross the corpus callosum to reach the LH. The duration of time for which this takes place is known as the interhemispheric transfer time (ITT). Thus, word recognition reaction time for the LVF would be slower than that of the RVF.

Pilot data collected from Yeshiva University students corroborated expectations and will be used as baseline reaction times. The next step is to test this procedure on MS patients. Due to callosal atrophy, we expect a more dramatic difference between the LVF and RVF reaction times. Patient MRI results will be evaluated for a potential correlation between the test and imaging. If the results support our theory, then this unprecedented use of the Divided Visual Field Paradigm can be adopted as a routine monitoring of CC function, and can facilitate earlier diagnosis of MS.

Rao SM, Leo GJ, Ellington, L, et al. Cognitive dysfunction in multiple sclerosis. II. Impact on employment and social functioning. *Neurology* 1991;41:692-696

Surgical Co-Management of Vascular Surgical Patients by Hospitalists, Is There Value?

Stephanie Zerbib¹, Leah Zerbib¹, D. Rizk², A. Capossela², E. Grabscheid², R. Calabrese², J. Mecca², S. Patel², K. Narag², V. Lavarias², N. Wohlberg², Thomas Bernik², Robert Grossi², H. Bodenheimer², M. Karpeh², D. Bernard², C. Mills², L. Sivaprasad², I. Michael Leitman², Burton Surick², Josh Roberts³, Jessica King⁴

¹Stern College for Women, Yeshiva University, New York, NY; ²Mount Sinai Beth Israel Medical Center, New York, NY; ³Cornell University, Ithaca, NY; ⁴Stony Brook University, Stony Brook, NY

Traditionally, patients undergoing vascular surgery in an urban teaching hospital received perioperative care from the surgical team. With the success of surgery-hospitalist co-management programs in other disciplines, such as orthopedics, the institution decided to implement a similar program for the vascular service. This retrospective study examines the implementation of a surgical-hospitalist co-management program (SHCP) that allows for shared responsibility for the care of vascular surgical inpatients between surgeons and hospitalists.

During two periods, 3/1/12 - 12/31/12 and 3/1/13 - 12/31/13, vascular surgical inpatients were monitored as normal during their 30-day post-operative periods, the only difference being the approach to care. Inclusion criteria included an ASA level of III or higher, and an expected length of stay of greater than 1 day. The same data was collected from the 2012 (pre-co-management) group and the 2013 (co-managed) group, including readmission rates, lengths of stay, and various complications. The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database was used to compare site findings to national data in order to review observed vs. expected outcomes for both groups of patients.

Of the 231 patients admitted to the service post-pilot, 53% were male, with an average age of 63 years. The study found that the average length of stay of patients decreased by 1.25 days, and the ACMI of this service increased by 0.19. The observed-to-expected ratio for the post-operative occurrence rate decreased from 0.826 to 0.598, indicating a notable positive improvement. There was also a significant reduction in the percentage of patients that had to return to the operating room after the principal procedure.

The SHCP improved communication among the medical professionals responsible for the care of the patient, leading to improved quality of care; More studies need to be conducted in this area to determine the full extent of what surgical-hospitalist co-management offers to vascular surgical patients.

Category	O.E Ratio Change	Notes	Positive or Negative?
Post-Op Occurrence Rate	-0.228	Fewer complications overall in patient population.	Positive
Was there a readmission of any reason within 30 days of the principal procedure?	+0.196	Higher frequency of patients had problems once they left the hospital.	Negative
Was there an unplanned return to the operating room for a surgical procedure within 30 days of the principal procedure?	-0.292	Fewer patients had to be brought back into the OR for surgery.	Positive
Cases with 0 occurrences	+0.076	A larger proportion of cases had 0 occurrences, indicating fewer complications.	Positive
Pneumonia	+0.483	The incidence of pneumonia was more common post-pilot.	Negative
On ventilator > 48 hours	-0.404	Fewer patients needed to be kept on a ventilator for more than 2 days.	Positive
Transfusion Intraop/Postop (72h of surgery start time)	-0.293	Fewer patients required a blood transfusion.	Positive

Table 1. Positive and Negative Results of Co-Management Project