

# Women in Science

2008-2009



Yeshiva University  
STERN COLLEGE FOR WOMEN

## Table of contents

Introductory Remarks.....	2
Department of Biology.....	7
Department of Chemistry and Biochemistry.....	13
Department of Physics.....	18
Department of Psychology.....	20
Combined Degree Programs.....	24
Kukin Lectures.....	26
Summer Research at the Albert Einstein College of Medicine.....	28
The Anne Scheiber Fellowship Program.....	28
<i>Derech HaTeva, a Journal of Torah and Science</i> .....	33
Student Publications and Presentations.....	48
<i>Science and Ethics: A Joint Perspective</i> .....	65
Abstract Booklets.....	73

### Co-editors

Fay Burekhovich

Aviva Schiffmiller

Hadassah Shulman

Danielle Taylor



## Introductory Remarks

The Departments of Biology, Chemistry/Biochemistry, Physics, and Psychology, each unique in their 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, physical therapy, occupational therapy, physician assistant programs, nursing, genetic counseling, nutrition, and diagnostic medical imaging; masters programs in biotechnology, public health, engineering, and bioinformatics; and doctoral programs in the biomedical sciences, chemistry, physics, neuropsychology, and clinical and school psychology. Education in biology, chemistry, physics and engineering sciences serves as a stepping stone to careers in research and education in technology-oriented fields, including nanoscience and nanotechnology.

Our departments direct students to stretch beyond the classroom experience through involvement in scientific research. Both in the academic year and 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. Summer internship opportunities for students in all the science majors are available at the world-renowned facilities of Brookhaven National Laboratory (BNL) as well as New Jersey Institute of Technology (NJIT). Furthermore, the science faculties actively encourage the science majors to apply for competitive undergraduate research internships, locally, nationally, and internationally. In the Summer 2009, more than 60 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 Balance Diagnostic Corporation, Baylor School of Natural and Environmental Sciences, Beth Israel Medical Center, Cedars-Sinai Medical Center, Children's Hospital of Pittsburgh, Harvard Medical School, Lehigh Valley Hospital, Long Island Jewish Medical Center, Montreal Jewish General Hospital, Mount Sinai Graduate School of Biological Sciences, NYU Medical Center, NYU Rusk Institute, Robert Wood Johnson Medical School, Rutgers University, St. Jude Children's Research Hospital, Temple University, Toronto Western Hospital, University of Ottawa Heart Institute, and University of Texas - Southwestern (see "Abstract Booklets of Student Research" for a descriptive analysis of the various projects and "Student Accomplishments" for a detailed listing of student internships). Our students' impressive records as coauthors on scientific articles in peer-reviewed journals, as well as on research abstracts of work presented at national meetings of scientific societies (see "Student Publications and Presentations"), are indicative of the quality of their input and of the high regard the sponsoring laboratories have for our students.

The Department of Psychology offers an Honors 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 reviewing the literature, data collection and management, and scientific writing and oral presentations.

A specific objective of the science departments at SCW, in addition to nurturing the highest level of academic achievement, is to provide students with opportunities for leadership roles. Upper level students may be appointed to positions as Teaching Assistants (TAs) for laboratory sections and as Recitation Instructors to review materials for the lecture sections of the science courses. Student-led clubs, such as the Biology Club, the Chemistry Club, the Physics Club, the Psychology Club, the PreMed Club, the PreDent Club, the Occupational Therapy Club, the Pharmacology Club, etc., provide opportunities for students to gain skills in organizing events and in coordinating social functions.

The Student Undergraduate Research Group Exchange (SURGE), a faculty-sponsored, student-led club, 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 power-point professional seminars. Faculty members also use these meetings to inform students of upcoming internships and fellowship opportunities. In the 2008-2009 academic year, the following students presented seminars at SURGE meetings:

Student Presenter	Topic	Affiliation/Institution
Daphne Davis	Bacterial Infections in Cystic Fibrosis	Children's Hospital and Regional Medical Center, Seattle
Emily Liebling	Health Education of an Inner-City Population using Multimedia Technology in the ER	Jacobi Medical Center/Einstein, NY
Tirtza Spiegel	Psychosocial Breast Cancer Research	Sunnybrook Health Sciences Centre, Toronto
Grace Charles	A Comparison and Analysis of the Interfacial Interactions Between Oxysterols and Other Membrane Lipids Versus Those of Native Cholesterol with Other Membrane Lipids	SCW
Ariel Levine	Utilizing Dredged Material as a Smoke Suppressant	SCW
Danielle Lent	Recycling Plastics Using Supercritical Carbon Dioxide	SUNY Stony Brook

Avital Bauman	Rab Protein Involvement in Podosome-Mediated Matrix Degradation in Macrophages	Albert Einstein College of Medicine
Aviva Schiffmiller	Theoretical Ranking of a Congeneric Series of Protein Kinase Inhibitor	SCW
Reena Gottesman	Potential Cross-Reactivity between Parainfluenza Type 3 Virus and Anti-Measles Monoclonal Antibodies	Montefiore Medical Center
Yehudit Fischer	A Computational Approach to Measuring Enzyme Plasticity	Albert Einstein College of Medicine
Malka Bromberg	Carbon Nanopaper Covered in Platinum as an Electrocatalyst in Hydrogen Fuel Cells	(SCW/New Jersey Institute of Technology/Brookhaven National Laboratory)
Miriam Merzel	Establishing and Validating a Dried Blood Spot Assay to Monitor Chitotriosidase in Gaucher Disease Patients	Mount Sinai
Hadassa Klerman	A Comparison of Multiple Methods of Analyzing Melatonin Concentrations for Circadian Phase and Amplitude Information	Brigham and Women's Hospital (Boston)
Ariella Hollander	Proteasome Abundance and Activity Determine Life Span	Albert Einstein College of Medicine
Batya Matla Herzberg	Genetic Studies of Adenosine Deaminase in the Rodent Malaria Parasites <i>Plasmodium yoelii</i> and <i>Plasmodium berghei</i>	Albert Einstein College of Medicine
Wendy Hosinking	Fat-Inducing Transcript Protein and Its Role in Oligomerization	Albert Einstein College of Medicine

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 (ACS). The costs of attending the meeting, including transportation and hotel, are underwritten by the Dean's Office, SCW, and by faculty research grants. In Spring 2009, Malka Bromberg, Grace Charles, Batya Herzberg, Amy LeVee, and Miriam Merzel attended and presented at the 237<sup>th</sup> National Meeting of the ACS, Salt Lake City, Utah (see "Abstract Booklets of Student Research").

At the end of each Spring semester, a representative of SCW is placed on the planning committee of the annual Yeshiva University Behavioral Science Research Day.

Students involved in behavioral science research at any Yeshiva University school are invited to submit abstracts, along with a faculty sponsor, describing their original research, literature review, or research proposal to the review committee. Accepted abstracts are presented as posters at the meeting, which is held on the AECOM campus. This meeting is a forum for undergraduate psychology students to interact with graduate students and faculty of the Ferkauf Graduate School of Psychology and of the Wurzweiler School of Social Work.

In 1991, with the support of Dr. Ira Kukin, a member of the Board of Trustees of Yeshiva University, an annual chemistry lecture series was established. The invited speakers are distinguished scientists, many of them Nobel Laureates, who direct their talks to the undergraduate students. Prior to the lecture, students have the opportunity to interact with the speakers and to participate in a question session afterwards. This annual lecture is attended by the undergraduate science students of Yeshiva University, selected high school students, science faculty, administrators, invited scientists from the New York area and Dr. Ira Kukin and his wife, Doris Kukin. Attending the Kukin lectures throughout their undergraduate career helps the students realize their progressive advancement in science through their increased understanding of the lectures. These lectures serve as an encouragement for our students to select a career in science (see "Kukin Lecture Series").

SCW graduates who will be 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 Spring 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 preparing for a career in teaching math and science at the elementary and high school levels (see "Combined Degree Programs").

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 Yeshiva University 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 13, and a sample article). The 2005-2006 academic year saw the publication of a new journal, *Science and Ethics: a Joint Perspective*. This journal discusses bioethical and biomedical issues of current interest, again relying of the unique strengths of our students – their combination of Torah and secular studies. Volume 4 was published in Summer 2009 (see "Science and Ethics" for a listing of articles that appeared in volumes 1 through 4, and a sample article).

The Departments of Biology, Chemistry/Biochemistry, Physics, and Psychology have much in common, yet each has its own distinct approach and style to educating and to stimulating learning. To become better acquainted with the sciences and with psychology at SCW, the reader is directed to the specific subsections for each department.

## Department of Biology

Faculty: Harvey Babich, Ph.D.; Bill Bassman, M.S.; Joseph DeSantis, Ph.D.; Emil Gernert, Ph.D.; Marina Holz, Ph.D.; Brenda Loewy, Ph.D.; Jeffrey Mollin, M.Phil.; Kaliris Salas-Ramirez, Ph.D.; Alyssa Schuck, Ph.D.; Margarita Vigodner, Ph.D.; Jeffrey Weisburg, Ph.D.; Richard Weiss, M.D.; Harriet Zuckerbraun, Ph.D.

The Department of Biology offers a wide range of courses that give students a thorough grounding in the fundamentals of modern biology, as well as exposing them to the cutting-edge areas of biomedical research. Course offerings include Anatomy, Biotechnology, Cell Biology, Developmental Biology, Ecology, Endocrinology, Genetics, Histology, Immunology, Invertebrate Zoology, Medical Biochemistry, Microbiology, Molecular Biology, Nutrition, Pharmacology, Physiology, Reproduction Biology, Virology, and Women's Health. Always seeking to introduce new courses, two new 2-credit courses, Neurobiology and Bioethics, are being taught in Fall 2009.

In recent years, innovative classes using the journal club approach were introduced. In these courses students read original scientific articles, present oral seminars, and develop the analytical skills for critical interpretation of experimental data. Such journal clubs, led by adjunct faculty from neighboring institutions (Mount Sinai School of Medicine, New York University Medical Center, and the Albert Einstein College of Medicine), have addressed the following topics: Stem Cell Research, Cancer Research, Apoptosis, Mouse Models of Cancer, and Protein Trafficking.

Aware of the need to maintain state-of-the-art technology, the Department of Biology constantly upgrades equipment for use in courses and for on-campus research. For example, within the past three years, five 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 were obtained. To enhance the laboratory experiences in the introductory Biology courses, both for Biology majors (Principles of Biology) and for non-majors (Essentials of Biology) 40 brightfield microscopes were purchased in summer 2008.

The Department of Biology has enhanced its image to become a teaching and research-based department. Within the past three years, SCW has increased faculty in the department by three additional members, each with her own research interest. The "junior" faculty, Dr. Margarita Vigodner (Ph.D, Department of Clinical Biochemistry, Tel Aviv University), Dr. Marina Holz (Ph.D., Department of Cell Biology, Harvard Medical School), and Dr. Alyssa Schuck (Ph.D., Department of Microbiology, New York University Medical Center), join several of the "senior" faculty members, actively engaged in on-campus research in our state-of-the-art research laboratories.

Undergraduates participate in these research projects, receiving exceptional hands-on experiences that extend their laboratory capacities beyond what is possible in a specific course.

As an introductory note to our new faculty, below are brief sketches of their extraordinary achievements.

Dr. Vigodner is the recipient of a \$300,000 grant from the Flight Attendant Medical Research Institute. The title of her grant proposal is, "Second Hand Smoke as a Potential Cause of Spermatogenic Failures and Male Infertility," with a start date of July 1, 2008. Her publications, since joining SCW, include:

- (a) Vigodner, M., 2009, Sumoylation precedes accumulation of phosphorylated H2AX on sex chromosomes during their meiotic inactivation, *Chromosome Research* (in press).
- (b) Vigodner, M., Weisburg, J.H., Shrivastava, V., Marmor, R., Fathy, J., and N. Skop, 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 and Tissue Research* (in press).

Dr. Vigodner presented the seminar, "Sumoylation precedes accumulation of phosphorylated H2AX on sex chromosomes during their meiotic inactivation, at the XX<sup>th</sup> North American Testis Workshop, April 1 - 4, 2009, Philadelphia, PA. To develop collaborative research associations, faculty in the Department of Biology interact professionally with research scientists in neighboring institutions. In Spring 2009, Dr. Vigodner presented the seminar, "Spermatogenesis as studied by advanced analytical tools of cell analyses: the role of SUMO proteins," to the Department of Developmental and Molecular Biology, Albert Einstein College of Medicine (AECOM); she has a secondary appointment as an Assistant Professor in that department.



Dr. Margarita Vigodner (left) training student research assistant Maryna Pekar (right) in proper cell culture technique.

Since Fall 2008, Dr. Marina Holz holds a secondary appointment as an Assistant Professor in the Department of Molecular Pharmacology, AECOM. In addition to presenting in the Molecular Pharmacology Seminar Series at AECOM, Dr. Holz presented a seminar to the research group of the Cancer Biology and Genetics Program at Memorial Sloan-Kettering Cancer Center and had an invited poster at the San Antonio Breast Cancer Symposium. The title of the poster was, "Estrogen receptor alpha is a target of mTOR/S6K1 signaling in control of breast cancer cell proliferation." Dr. Holz was awarded a \$75,000 grant for 3 years from the Elias and Genevieve and Georgianna ATOL Charitable Trust. The title of her research project is, "The role of S6 kinase 1 in breast cancer." More recently, Dr. Holz was awarded a one-year grant from the Wendy Hill Case Cancer Fund, Inc., for \$30,000 with a start date of July 1, 2009. The title of that grant is, "The role of the mTOR/S6K1 pathway in breast cancer."

Since joining the Biology Department, Dr. Holz's major publications include the following:

- (a) Holz, M.K. and Blenis, J., 2008, Ribosomal protein S6 kinase beta-1 target assessment review, *Targeted Proteins Database, Current Biodata*, doi:10.2970/tpdb.2008.212.
- (b) Holz, M.K. and Blenis, J., 2008, Ribosomal protein S6 S6 kinase beta-2 target assessment review, *Targeted Proteins Database, Current Biodata*, doi:10.2970/tpdb.2008.161.
- (c) Holz, M.K. and Blenis, J., 2008, Eukaryotic translation initiation factor 4E- binding protein 1 target assessment review, *Targeted Proteins Database, Current Biodata*, doi:10.2970/tpdb.2008.208.
- (d) Yamnik R.L., Digilova, A., Davis, D.C., Brodt, Z.N., Murphy, C.J., Holz, M.K., 2009, S6 kinase regulates estrogen receptor (alpha) in control of breast cancer cell proliferation, *Journal of Biological Chemistry*, 284:6361-6369.

Rachel Yamnik, cited in the above-noted manuscript, is a SCW graduate (May 2008), and was awarded the Yeshiva University Graduate Research Fellowship. Rachel spent the 2008-2009 academic year training under the guidance of Dr. Holz.

Dr. Alyssa Schuck, an alumnus of SCW, initiated a research program geared primarily to freshman/sophomore Biology majors within the Honors Program. Dr. Schuck, in collaboration with Drs. H. Babich and H.L. Zuckerbraun of the Department of Biology, coauthored the following manuscripts

- (a) Schuck, A.G., Ausubel, M.B., Zuckerbraun, H.L., and Babich, H., 2008, Theaflavin-3, 3'-digallate, a component of black tea: an inducer of oxidative stress and apoptosis, *Toxicology In Vitro*, 22:598-609.
- (b) 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 Clinical Pharmacology and Toxicology* 103:66-74.

- (c) 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 Cellular and Developmental Biology - Animal* 45:226-233.
- (d) Babich, H., Ackerman, N.J., Burekhovich, F., Zuckerbraun, H.L., and A.G. Schuck, 2009, *Ginkgo biloba* leaf extract induces oxidative stress in carcinoma HSC-2 cells, *Toxicol. In Vitro* (in press).

In addition, Dr. Schuck coauthored the following manuscript:

- (e) Schuck, A.G., Diwa, A. and Belasco, J.G., 2009, RNase E autoregulates its synthesis in *Escherichia coli* by binding directly to a stem-loop in the 5' untranslated region. *Molecular Microbiology* (in press).



Dr. Alyssa Schuck (center) supervises summer research interns Chana Gila Levy (left) and Lori Solodokin (right).

Dr. Jeffrey Weisburg, who joined the Department of Biology in 2004, actively collaborates externally with Dr. D. Scheinberg, Sloan-Kettering Institute for Cancer Research, and has collaborated internally with Dr. Vigodner. Since joining the Department of Biology, Dr. Weisburg has authored the following manuscripts:

- (a) Weisburg, J.H., Weissman, D.B., Sedaghat, T., and Babich, H., 2004, *In vitro* cytotoxicity of epigallocatechin gallate (EGCG) and tea extracts to cancerous and normal cells from the human oral cavity, *Basic Clinical Pharmacology and Toxicology* 95:191-200.
- (b) Weisburg, J.H., 2008, Invited perspective. Multidrug resistance in acute myeloid leukemia: potential new therapeutics, *Journal of Nuclear Medicine* 49:1405-1407.
- (c) Vigodner, M., Weisburg, J.H., Shrivastava, V., Marmor, R., Fathy, J., and N. Skop, 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.* (in press).

- (d) Weisburg, J.H., Clark, E., Seidenman, J., Gardner, J., Scheinberg, D.A., and Silverman, J., 2009, Mechanisms of resistance to oxidative stress in leukemia cells, (in preparation).

Those SCW undergraduates who participated in many of the above-cited research projects presented posters of their research at professional and undergraduate symposia. Listed below are some of these presentations, with names of the SCW undergraduates underlined:

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

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

Off-campus research placements abound, including the Roth Scholars Program at AECOM and other research internships sponsored by Yeshiva University (see Students Accomplishments, 2008 and Roth Scholars.). For additional information, see "Abstract Booklets of Student Research" and "Student Publications and Presentations."

As of Spring 2009, the Department of Biology entered into an agreement with Dr. Martin Grumet, Director of the Rutgers University Cell Research Center and of the W.M. Keck Center for Collaborative Neuroscience, Rutgers University, to establish the Rutgers-Yeshiva Summer Undergraduate Research program. Barrie Cohen was the selected intern for this 10-week laboratory research experience on the Rutgers campus, where she engaged in hands-on experimentation in the neurosciences.

The department hosts a spectrum of interesting seminars, both purely scientific and others employing the Torah U'Madda approach. The Biology Club organized some of the following seminars:

- (a) Dr. B.Y. Rubin, Fordham University, "Preventing and treating Jewish genetic diseases: individuals can make a difference"
- (b) Dr. R. Grazi, founder of Genesis Fertility & Reproductive Medicine, "Discussions of careers in reproductive health"
- (c) Dr. D. Repetto, Research Director at Columbia University's Computer Music Center, "Making art with living systems"



- (d) Dr. Miryam Wahrman, William Paterson University of NJ, "In search of wandering Jewish genes"
- (e) Dr. A.M. Kenney, Cancer Biology and Genetics Program at Sloan-Kettering, "Connections between brain development and brain cancer"
- (f) Dr. M. Grumet, Rutgers University Cell Research Center, "Molecular and cellular neuroscience of CNS injury and disease"
- (g) Discussion panel on careers in biology with professionals from different fields, including toxicology, patent law, public health, and graduate school administration

The recently founded student-led club, The Pharmacology Club, sponsored the seminar:

- (h) Dr. B. Francis and Dr. M. Israel, research scientists, Novartis Pharmaceuticals, "Diabetes research at Novartis"

The *Torah U'Madda* seminars included:

- (a) Rabbi Y. Kleiman, The Center for Kohanim, Jerusalem, Israel, "The DNA connection: modern Jews and ancient Hebrews"
- (b) Rabbi Dr. E. Reichman, AECOM, "Reinventing life and redefining death: medical *halakha* for the 21<sup>st</sup> century"
- (c) Rabbi N. Slifkin (noted author and lecturer), "How to avoid bear attacks and thereby save the Jews"

Dr. Brenda Loewy, a faculty member of the Biology Department, was the recipient of the 2008 Dean Karen Bacon Award for a Senior Faculty Member, Stern College for Women, Yeshiva University. A prime responsibility of Dr. Loewy is to serve as the college's Pre-Health Advisor, and to guide students interested in medicine, dentistry, optometry, and the allied health fields through the application process. Dr. Loewy organizes a series of wide-ranging seminars. Programs in the 2007-2008 academic year included seminars in which the guest speakers provided valuable insight into the various professions, as well as information on the admissions process to their graduate and professional programs.

Examples of such seminars include the following:

- Dr. Paul Alexander, "Technion American Medical School Program"
- Dr. Sharon Herzfeld, "A day in the life of a religious female neurologist"
- Dr. Gila Jedwab and Dr. Riki Kreitman, "Women in dentistry"



Anatomy students Deborah Mansdorf (left) and Miriam Escott (right) performing a dissection in lab class.

## Department of Chemistry and Biochemistry

Lea Blau, Ph.D.; Lora Danley, M.S.; Cecily Dobin, M.S.; Donald Estes, Ph.D.; Sofiya Kozlova, Ph.D.; Evan Mintzer, Ph.D.; Chaya Rapp, Ph.D.; Lance Silverman, 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.

Students are an integral part of on-campus research by faculty members. Under the mentorship of Dr. Don Estes and Dr. Lea Blau, Sarah Guigui and Nili Seleski participated in research on the effect of base stacking on the stability of deoxyligonucleotides and in the development of a biophysical chemistry experiment on DNA stability for the *Physical Chemistry On-Line Consortium*. The students presented their work at SCW and a manuscript is in progress. Under the supervision of Dr. Sofiya Kozlova, Ariel Levine studied the smoke suppressant properties of clay-silicate sediments from the New York harbor. The goal of the project was to allow the recycling of the sediments, as coatings to walls and ceilings, in order to reduce the smoke concentration in the event of a fire. Hanna Cooper plans to study the moisture behavior of concrete structures with dredged sediment fillers. Research in computational chemistry, in the area of protein tertiary structure, is ongoing under the mentorship of Dr. Chaya Rapp. A paper on the topic of docking receptor/ligand complexes, co-authored by student Chani Schonbrun, is in press in the journal *Proteins*; and current work on ranking affinities of congeneric ligands has recently been presented by student Aviva Schiffmiller at the Columbia Undergraduate Research Symposium. Under the supervision of Dr. Evan Mintzer and in collaboration with Dr. P.V. Subbaiah from the University of Illinois-Chicago Department of Medicine, Tamar Weinberg and Shlomit Schwalb studied the behavior of conjugated fatty acid-containing phosphatidylcholines in model membranes. Biochemistry major and Chemistry Club President Grace Charles worked in Dr. Mintzer's biophysical chemistry lab, investigating the effect of oxidized cholesterol analogs on lipid monolayers. In 2009, her work was presented at the Biophysical Society's meeting, the national meeting of the American Chemical Society, and at the Columbia Undergraduate Research Symposium. Currently, S. Daniel Abrahams Honors student Esther Fisher is investigating the differences in rates of cyclodextrin-mediated desorption of the oxysterols from binary monolayers in an effort to probe their relative affinities for phospholipids. Sharon Gordon is using a detergent solubility assay to compare the propensity of oxidized sterols to form lipid rafts with that of native cholesterol. An additional area of interest for this lab is the biophysical behavior of the pleiotropic lipid lysophosphatidic acid (LPA). Anne Press and Juliet Meir are using a model bilayer system in an effort to examine the thermodynamics of LPA-membrane and LPA-peptide interactions.



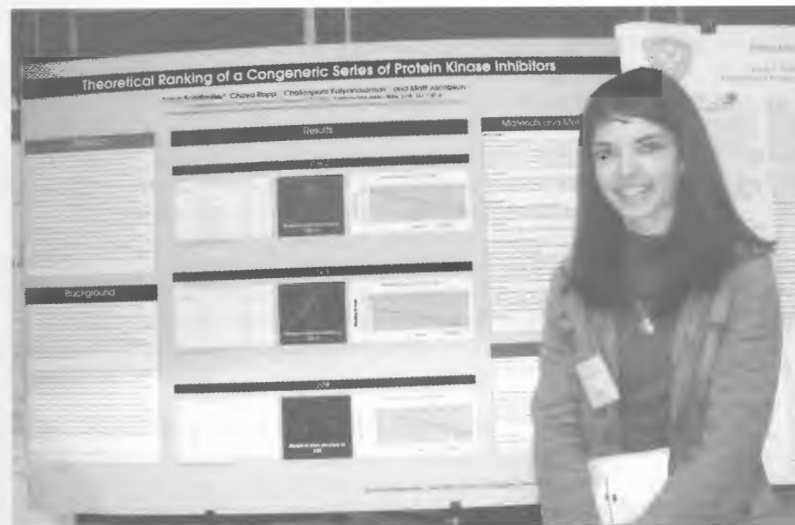
The Stern College Chemistry Club, advised by Drs. Rapp and Estes, is an award winning affiliate of the American Chemical Society (ACS) and has earned three Innovative Activities Grants for programming over the past four years. Each year the club runs activities related to a particular theme; recent themes have included "Careers in Chemistry" and "Chemistry and Nutrition". Activities include guest lectures; field trips to pharmaceutical companies, the Food and Drug Administration, museums; and other cultural events. To interest the entire student body, tie-dyeing and a magic show are also included in the club's activities. The colorful magic show, directed by Mrs. Cecily Dobin and performed by members of the club, is the highlight of the year. The show is attended by Stern College students as well as local high school students. Over the past nine years, in recognition of its various accomplishments, the club has been presented with Outstanding, Commendable, Honorable Mention, and Green Chemistry awards at ACS national meetings.



*Grace Charles, the president of the chemistry club, accepts the award for outstanding achievement at the ACS meeting in Salt Lake City, Utah.*



*Dr. Evan Mintzer with student presenters at the poster session of the ACS meeting.*



*Aviva Schiffmiller, a student of Dr. Chaya Rapp, presents her research at a poster session at Columbia University.*



*Pardis Parizadeh, a student in organic chemistry, participates in the magic show.*

In recent years, the number of students enrolled in chemistry courses has increased significantly. In order to maintain small classes, two sections of Organic Chemistry lectures are offered and the number of laboratory sections in both General and Organic Chemistry were increased. The laboratory course in Organic Chemistry has been upgraded as a result of the purchase of an NMR spectrometer and a polarimeter. The Analytical Chemistry lecture and laboratory are upgraded to emphasize modern instrumental methods and to include a series of laboratory experiments to characterize the molecular composition of bone. In the Biochemistry Laboratory course, new experiments on lipid monolayers, lipid rafts, and model membranes were introduced. Incorporation of laboratory experiments in Analytical Chemistry and Biochemistry that are related to the instructors' research interests allows new course content to be taught in the context of current, cutting-edge and biologically relevant research. In addition, a journal club/seminar course on a novel area of chemistry is given, usually by a visiting professor.

Recently, a chemistry course for non-science majors examining chemistry as it relates to the world around us with emphasis on contemporary environmental issues, was introduced. Furthermore, a course in medicinal chemistry dealing with the discovery and design of new therapeutic agents and their development into useful medicines, will be offered in 2010.

In response to students who have expressed greater interest in chemistry as it pertains to the life sciences, the Biology and Chemistry Departments have collaborated in the initiation of the Biochemistry major. Since its inception, interest in this area has grown impressively. During the 2007/2008 academic year the Biochemistry major was approved by the New York State Education Department. In May 2008, four students were awarded a bachelor's degree in Biochemistry, and in May 2009 four students received a bachelor's degree in Biochemistry and two students received a bachelor's degree in Chemistry.

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

Anatoly Frenkel, Ph.D.; Professor, Emil Prodan, Ph.D.; Assistant Professor  
Lea Ferreira dos Santos, Ph.D.; Assistant Professor; Mark Edelman, Ph.D.;  
Clinical Assistant Professor; Gelu Nitu, Ph.D.; Adjunct Assistant Professor  
Amish Khalfan, Ph.D.; Adjunct Instructor; Qi Wang, Ph.D., Research Associate

The Physics Department at Stern College for Women (SCW) has been steadily gaining interest among incoming freshmen due to its "research and discovery approach" to education. Many talented students aspire to a degree in physics due to the opportunities that have been created in the department over the last few years. Students have access to the state of the art experimental facilities in the National Laboratories and major research centers through collaborative research and education programs that the Physics Department has created. Such exposure to first class science and the atmosphere of discoveries plays a major role in helping undergraduate students shape their career plans.

Since the 2005-2006 academic year, a new B.A. Physics program is offered for incoming freshmen. Yael Sussman was the first Stern College student to graduate with a B.A. in Physics (she obtained her degree in 2007). Among recent graduates, one student is in Columbia University's doctoral program in Physics, another is in Hunter College's doctoral program in Physics, and one student has been accepted to several graduate programs in Engineering.

SCW students who are interested in Physics or Engineering have an opportunity to actively participate in faculty research. The Physics Department is always seeking new students interested in doing first-class research. They can choose from a variety of projects and work under the guidance of physics department members. SCW Physics students undertake research during the summers and throughout the year. They present their results at national and international science meetings and give seminar talks. They 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, who joined the college in the fall of 2007, specialize in theoretical condensed matter physics. Dr. Santos' research interests include quantum entanglement, quantum chaos and control, random matrix theory, and quantum computing, among many others. Her research is supported by a grant from the Research Corporation. Dr. Prodan's interests are in strongly correlated systems, bio-materials, charge and spin transport. His research is also supported by a grant from the Research Corporation. 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 established Synchrotron Catalysis Consortium at Brookhaven National Laboratory. This facility is funded by the Department of Energy and has recently been awarded renewed funding for the next three-year term (2008). Many research activities involving SCW students take place at the Consortium facilities.

Dr. Edelman is a theoretical physicist who specializes in chaos theory and astrophysics. Dr. Gelu Nita and Amish Khalfan are adjunct faculty members who conduct theoretical research in astrophysics and high energy physics, respectively. Dr. Qi Wang, a postdoctoral research associate, started in March 2007. She is supported by a catalysis grant awarded to Dr. Frenkel by the Department of Energy and is stationed at Brookhaven National Laboratory.

Physics students benefit from an intense and challenging curriculum. In the spring of 2009, the physics courses offered included General Physics (calculus based), Introductory Physics (algebra based), Electromagnetic Theory, Quantum Mechanics, and Mathematical Physics (all honors courses). 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 the faculty members.

The department is also engaged in enhancing the participation of women in physics and promoting gender equality in science. In this context, Dr. Santos was selected as one of the 70 applicants from the United States to join a US delegation at the 3<sup>rd</sup> IUPAP International Conference on Women in Physics in South Korea. She wrote an article describing the repercussion of this conference at Stern College, which was published in a newsletter by the American Physical Society.

## Department of Psychology

Faculty: Joshua Bacon, Ph.D.; Terry DiLorenzo, Ph.D.; Robin Freyberg, Ph.D.; Aharon Hersch Fried, Ph.D.; Lauren Harburger, Ph.D.; Marcel Perlman, Ph.D.; Helen Rozelman, M.S.W., Ph.D.

The Department of Psychology is a recent addition to the Women in Science publication. As a discipline, Psychology is more often categorized as a Social Science, with other fields such as Social Work, Political Science, Economics, and Sociology. However, scientific methodology and empirical research have always been a critical component of the coursework and extra-curricular opportunities offered by our department. Experimental Psychology, as a prerequisite for the majority of other courses offered, highlights the fundamental importance that we place on understanding the subject matter of psychology in the context of rigorous empirical analysis, research methodology, and scientific thinking. The Research Seminar, a course taken by virtually every psychology major who is interested in pursuing a career in Clinical 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. Our newest faculty member, Dr. Lauren Harburger, received her Ph.D. in 2008 from Yale University. In the one year that she has been with us, Dr. Harburger established an active lab to develop her research program in the neurobiology and psychology of sex differences and memory, and has involved students in all facets of her research.

Students who are planning to apply to Ph.D. or Psy.D. programs in Psychology or to pursue careers in the other health-related fields such as Physical, Occupational, or Speech Therapy are encouraged to become actively engaged in research. In just three years since joining the Psychology Department, Dr. Robin Freyberg has opened a Social Development Laboratory and developed a dynamic research program that has involved over 20 students. Students who have worked with Dr. Freyberg, with Dr. Joshua Bacon in the Multiple Sclerosis Care Center at NYU, with Dr. Aharon Fried on his research in Special Education in the Hebrew Schools, or with Dr. Terry DiLorenzo in her research focusing on health-related attitudes and cognitions and their relations to health behaviors have all gained invaluable experience outside of the classroom, learning about the fundamental role of research in the theory and practice of psychology. Many of these students have coauthored presentations at both national and international conferences.

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

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

Dr. Joshua Bacon received his PhD 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, and 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 SCW 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 SCW 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 individuals with multiple sclerosis and women receiving radiation treatment for breast cancer. Dr. DiLorenzo has involved a number of SCW 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 SCW and Yeshiva College students.

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 SCW 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 SCW, she has supervised over 20 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 SCW including Introductory Psychology, Developmental Psychology, Social Psychology, Cross-Cultural Social Development, Personality, and the Psychology of Women. 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 Hersch 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 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. Lauren Harburger earned a B.S. from Cornell University in Human Biology, Health, and Society. She then attended graduate school in the Department of Psychology at Yale University where she earned her M.S., M.Phil., and Ph.D. During graduate training, Dr. Harburger investigated the effects of age, sex, and ovarian hormones on learning and memory. Her dissertation examined the molecular mechanisms of female sex hormones and how they affect memory and was titled, "Effects of Estradiol and Progesterone on Memory Consolidation and Hippocampal ERK Activation in Female Mice." Her research has been published in *Behavioral Neuroscience*, *Neurobiology of Learning and Memory*, *Neurobiology of Aging*, *Behavioural Brain Research*, and *Journal of Neuroscience*. Dr. Harburger joined the SCW faculty in fall 2008 where she continues to examine the effects of age and sex on learning and memory. She enjoys teaching at SCW and offers a number of courses including Introductory Psychology, Developmental Psychology: Life Span, and Psychobiology.

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

Dr. Helen Rozelman earned a B.A. in Philosophy from Stony Brook University. She holds an M.A. in Applied Psychology from Teachers College, Columbia University, an M.S.W. from Fordham University, and a Ph.D. in Clinical Health Psychology from Ferkauf Graduate School of Psychology of Yeshiva University. Dr. Rozelman is a psychologist at New York University School of Medicine, Department of Pediatrics, Division of Infectious Diseases, where she is currently working on a Pediatric HIV/AIDS Cohort Study. Dr. Rozelman co-authored a chapter with Dr. Gary Walco on the Assessment and Treatment of Chronic and Recurrent Pain in Adolescents that is due to be published this fall in *Behavioral Approaches to Chronic Disease in Adolescence*, William O'Donohue, Ph.D. and Lauren W. Tolle, M.A., Editors, University of Nevada, Reno. Dr. Rozelman is also a North American Riding for the Handicapped Association (NARHA) Registered Horseback Riding Instructor and a Divorce Fee Mediator and Arbitrator for the Unified Court System of New York State. Dr. Rozelman joined the Psychology Department at SCW in the Fall of 2007 and teaches Introduction to Psychology, Personality, Health Psychology and Life Span Development.

## STERN COLLEGE FOR WOMEN COMBINED DEGREE PROGRAMS

The following are the basic elements of combined degree programs in the sciences available to SCW 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.S. or B.A./M.S.**

Stern College offers several combined plans in Engineering with Columbia University and Stony Brook University (SBU). Students in joint YU-Columbia 3+2 plan attend SCW for 3 years, take the prescribed coursework, and, with recommendation of the Pre-Engineering advisor, may be admitted to Columbia University's School of Engineering and Applied Science (SEAS). After successful completion of the 2-year program at Columbia, SCW awards the B.A. in Pre-Engineering, and Columbia awards the B.S. in Engineering. In addition, students can fulfill requirements for a minor in physics at SCW. Under the 4+2 plan, the student completes a B.A. degree at SCW, while fulfilling prerequisites for SEAS. After two additional years of study at Columbia, the student receives the M.S., bypassing the bachelor's degree in Engineering.

Students in joint YU-SBU 3+2 program start their education at SCW and finish at SBU's College of Engineering and Applied Sciences (CEAS). After spending 3 years at SCW, students will have an option to either graduate with a B.S. degree in Engineering from SBU or take graduate level courses during their second year at CEAS and graduate with an MS degree, also in 2 years.

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

SCW offers a combined program in Nursing with Johns Hopkins University. Students spend three years at SCW completing college requirements and pre-requisite courses for a total of 111 credits, followed by a one-year accelerated program at Johns Hopkins. Upon successful completion of these studies, students earn a B.A. from Stern College and a B.S.N. from Johns Hopkins. Students may then continue on for a Masters degree. Depending on the major selected, these additional studies leading to the MSN may take one or two years.

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

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

### **Optometry - B.A./O.D.**

SCW and the State University of New York State 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.**

SCW offers combined programs in Physical Therapy with New York Medical College Graduate School of Health Sciences and the University of Medicine and Dentistry of N. J. During the first three years at SCW, 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.P.S.**

SCW 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.P.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 SCW. The M.P.S. degree is awarded after completing two years and three months at Mercy.

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

SCW 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 & Science - B.A./M.A.**

SCW and NYU Steinhardt offer an accelerated option for a Master's Degree in Mathematics and Science Education. During the junior and/or senior year students may take up to 14 credits at NYU Steinhardt which will count toward both the undergraduate and graduate degrees. Students pay NYU directly for these credits. Yeshiva University awards students the B.A. degree after completion of all B.A. requirements and NYU awards an M.A. degree upon completion of the graduate program.

## Kukin Lectures

In 1991, with the support of Dr. Ira Kukin, a member of the Board of Trustees of Yeshiva University, an annual chemistry lecture series was established. The invited speakers are distinguished scientists, many of them Nobel Laureates, who direct their talks to the undergraduate students. Prior to the lecture many students have the opportunity to interact with the speakers and afterwards to participate in a question session.

This annual lecture is attended by the undergraduate science students of Yeshiva University, selected high school students, science faculty, administrators, invited scientists from the New York area, and Dr. Ira Kukin and his family.



*Dr. Harry Gray, the 2008 Kukin lecturer.*



*Dr. Harry Gray with students from SCW*

	Date	Guest Lecturer	Title of Lecture	Affiliation
1	November 5, 1991	Roald Hoffmann*	Logical Structure of Modern Chemistry	Cornell University
2	November 4, 1992	Jerold Meinwald	The Chemistry of Everyday Insect Life	Cornell University
3	December 7, 1993	Elias J. Corey*	Molecular Robots, Small Molecules as Enzyme-Like Catalysts	Harvard University
4	October 10, 1994	Derek Barton*	How to Win the Nobel Prize	Texas A&M
5	December 6, 1995	Ephraim Katchalski Katzir	A Scientist as State President: Experiences and Expectations	Weizmann Institute
6	November 4, 1996	Alfred Bader	The Chemist as Entrepreneur	
7	November 19, 1997	William N. Lipscomb*	Chemistry of the 20 <sup>th</sup> Century: The Structure-Function Relationship	Harvard University
8	October 28, 1998	Dudley Herschbach*	The Impossible Takes a Little Longer	Harvard University
9	December 1, 1999	Sylvia Ceyer	The Unique Chemistry at Surfaces: Splats, Hammers, and Sinkholes	MIT
10	November 1, 2000	Julius Axelrod*	Neurotransmitters and Psychoactive Drugs	NIH
11	November 12, 2001	Mary Good	Science and Technology Policy: Why You Should Care	University of Arkansas
12	October 29, 2002	Mario Molina*	The Antarctic Ozone Hole	MIT
13	November 12, 2003	Ronald Breslow	The Chemistry-Biology Interface	Columbia University
14	October 11, 2004	Jacqueline K. Barton	DNA Charge Transport: Chemistry and Biology	California Institute of Technology
15	December 13, 2005	Martha Greenblatt	The Beauty and Fascination of Solids	Rutgers University
16	December 4, 2006	Cynthia M. Friend	The Wonderful World of Surfaces	Harvard University
17	November 14, 2007	George M. Whitesides	Biomaterials Science	Harvard University
18	November 10, 2008	Harry B. Gray	The Grand Challenge of the 21st Century: Making Fuel from Sunlight and Water	California Institute of Technology

\* Nobel Laureates

## Summer Research at the Albert Einstein College of Medicine

Every year, several of Stern College for Women'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), provides students with exposure to nine weeks each summer of intensive biomedical research. Under the guidance of AECOM's top scientists, these women participate in research projects, many of which are at the cutting edge of medicine. For the summer of 2009, four SCW women were selected for this undergraduate research experience, having successfully passed the rigorous application and interview process. In addition, through the Office of the Vice President for Academic Affairs, Dr. M. Lowengrub initiated a research internship, the University Undergraduate Research Scholar. For the summer of 2009, two SCW women were awarded this internship. Recently, SCW graduates, currently medical students at AECOM, established an undergraduate research internship, the Stern-Einstein Research Connection (SERC) Scholar. The University Undergraduate Research Scholar and the SERC Scholar performed summer research at AECOM.

### 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 Summer Research Scholar

Shifra Klein

#### SERC Scholar

Wendy Hosinking

### Summer 2006

#### Roth Scholars

Michelle Cohen	Jessica Feig
Elizabeth Ravkin	Louissette Soussan

#### University Undergraduate Summer Research Scholar

Michelle Goldberg	Yelena Kozirovsky
-------------------	-------------------

### Summer 2005

#### Roth Scholars

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

#### 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 ScholarsCaryn Gamss  
Meryl SavaJulia (Tobi) Josovitz  
Anna Sedletcaia**Summer 2001**Roth Scholars

Shayna Aster

Elena Sedletscaia

Yehudit Weinberger

University Undergraduate Summer Research Scholar

Bracha Kenigsberg

Hadassa Rutman

Meredith Weiss

**Summer 2000**Roth Scholars

Shira Rivkin

Shiry Wagner

**Summer 1999**Roth Scholars

Olga Dynina

Rochelle Goldfisher

**Summer 1998**Roth Scholars

Jeniffer 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 Wurzburger

**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 SCW undergraduates, as well as graduates, pursuing their advanced training at the Albert Einstein College of Medicine. The program, established by Ms. Scheiber through a twenty-two million dollar bequest, seeks to support high achieving women with financial need to realize their academic and professional goals. SCW 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	Aliza Forman	Shira Roszler
Agnes Nathalie Abitol	Rena Frankel	Rachel Rubinstein
Abigail Atlas	Caryn Gamss	Naomi Schneider
Miriam Ausubel	Ariella Glueck	Chana Schonbrun
Tamar Belsh	Reena Gottesman	Necahma Mina Shoshani
Nomi Ben-Zvi	Julia Josowitz	Michelle Simpser
Deena Blanchard	Chava Kahn	Shani Snyder
Yael Boyarsky	Lea Kozirovsky	Tehilla Stepansky
Zahava (Nilly) Brodt	Malka Krupka	Temima Strauss
Aliza Charlop	Elisheva Levine	Yehudit Weinberger
Esti Charlop	Ariella Nadler	Amanda Weiss
Elana Clark	Helen Nissim	Meredith Weiss
Davida Cohen	Yardanna Platt	
Michelle Cohen	Tehilla Raviv	
Ellen Dinerman	Yael Raymon	
Abigail Feldman	Tamar Riegel Weinberger	
Tova Fischer	Shuli Roditi-Kulak	

## Derech HaTeva, a Journal of Torah and Science

*Derech HaTeva* is an undergraduate publication of Stern College for Women. The articles are authored primarily by science majors, although students in other majors submit articles. 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. 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 warning: The hot topic, pp. 30-32.  
 Grossman, J., Teeth: taking a bite of *Tanach*, Talmud, and *halacha*, pp. 34-34.  
 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., *Tzafadinah*: 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 *tiroshe* 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, 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, 34-38.  
Liebman, D., Divine dentistry, 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.

### Volume 1: 1997

- 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.

## Tekhelet - A Chemical Conundrum

By Emily J. Liebling

(reprinted from: *Derech HaTeva, a Journal of Torah and Science*, 13:47-49)

"...And they shall place upon the *tzitzit* of the corners [of the garment] a thread of *tekhelet*" (*Bamidbar* 15:38).

"You shall make the *mishkan* of ten curtains twisted linen and *tekhelet* and *argaman* and *tola'at shani*..." (*Shemot* 26:1).

"You shall make the robe of the *ephod* entirely of *tekhelet*" (*Shemot* 28:31).

These verses represent a mere sample of the myriad references made to the pigment of *tekhelet* in the Torah. Conventionally translated as the color turquoise, *tekhelet* has become nothing short of a mystery to its seekers. The *chilazon* is the source of *tekhelet* (*Shabbat* 26a), yet we are no longer certain of its exact species. As such, the *Midrash* states that the *tekhelet* has been concealed and today we possess only white *tzitzit* (*Bamidbar Rabba* 17:5) [1]. Because of this anonymity the majority of observant Jews continue the tradition of not using *tekhelet*. In relatively recent times, however, there has been a concerted effort to re-determine the nature of *tekhelet* and the process of its production.

The color of *tekhelet* has long been associated with royalty and nobility, as can be seen from the verse, "clothed in *tekhelet*, governors and rulers..." (*Yechezkel* 23:6). The vestments of the *Kohein Gadol* were sewn of *tekhelet*-dyed wool and the palace of King *Achashverosh* was adorned with the piercing blue, as well (*Esther* 1:6). The *Gemara*, in *Menachot* 44a specifies that "the *chilazon* emerges from the water once every seventy years and with its blood *tekhelet* is dyed; therefore, *tekhelet* is expensive." *Rashi* comments that the rarity with which the *chilazon* appears on land is the reason for its astronomic cost. This could provide an understanding as to why the color was found mainly in the company of the wealthy. In fact, it was precisely the harvesting of the *chilazon* that gave the tribe of *Zevulun* its great wealth. When Moshe blessed *Bnei Yisrael* before his death, he declared to *Zevulun*, "...for by the riches of the sea they will be nourished and by the treasures concealed in the sand" (*Devarim* 33:19). The Talmud, in *Megilla* 6a, discloses that the "treasures" refer to "white glass" and the blood of the *chilazon*.

In various and disparate locations, the *Gemara* gives several criteria by which the *chilazon* is identified. Why, then, is this creature unbeknownst to us today? The answer lies in the fact that our tradition gives specific criteria for the *chilazon*, but several species would have to be combined to meet those criteria. Some of the physical characteristics include:

- Its appearance on land once every 70 years (*Menachot* 44a).
- Its anatomy is like that of a fish (*Menachot* 44a).
- It is captured with nets that are lowered into the water (*Shabbat* 74b).
- Its capture on *Shabbat* is prohibited by *tzad* (*Shabbat* 75a).

- The method of dye extraction from the *chilazon* is described as “*potzea*”, the cracking of a hard surface (and not *korea*, which would imply the ripping of flesh) (*Shabbat* 75a). Descriptions of the *tekhelet* itself are given, as well:
- Its blood is collected in a separate sack, and does not diminish the life of the *chilazon* upon extraction (*Tosfot*, *Ketuvot* 5b).
- The dye is of better quality when extracted from a live *chilazon* (*Shabbat* 75a).
- The color of *tekhelet* from the *chilazon* is identical to that of *kala ilan* (indigo) (*Bava Metziah* 61b).
- *Tekhelet* is permanent and does not fade with time nor wash out of the dyed wool (*Menachot* 43b).

The question now remains as to why the manufacture and wearing of *tekhelet* fell out of practice? There has been much speculation about the disappearance of *tekhelet*. No doubt ever existed in our tradition as to the identity of the *chilazon* or the process of *tekhelet* production. The falling from practice of dying with *tekhelet* was not a result of suddenly forgetting how to accomplish the task, but, rather, it was due to the political decrees of Rome, as well as the enormity of its cost. During the supremacy of the Roman Empire, emperors, among them Valentinian, Theodosius, and Arcadius, proclaimed an official prohibition against the public production of *tekhelet*. They restricted the wearing of this royal color only to certain nobility. Thus, the great danger posed by the capital punishment associated with the use of *tekhelet* caused it to become lost as the generations passed. Additionally, the production of *tekhelet* was very expensive, even for the nobility who were permitted to use it. To appreciate the expense that *tekhelet* represented, in 301 BCE, one pound of *tekhelet*-dyed wool cost 50,000 *dinarii*, a salary of almost three years for a baker[2].

Although modern day evidence is not supportive, *Rambam*, *Rashi*, and *Tosfot* agree that the *chilazon* is a fish. This creature satisfies the first three criteria, but how, then, can its dye be removed by *potzea*, which would imply that the *chilazon* has a hard shell to be cracked or smashed? *Rashi* resolves the issue and proposes that in this context, *potzea* means “squeezing out” the blood, or dye, from the *chilazon*. Some maintain that because *tekhelet* is used in the construction of the *mishkan*, it is necessarily derived from a kosher source. Others disagree, however, and counter that since the dye in and of itself, is not substantive, and is used to color materials which must adhere to *kashrut* laws, it may come from non-kosher animals [3].

With the advent of a renewed Messianic enthusiasm of the nineteenth century came a resurrection of the search for *tekhelet*. Religious leaders wrote and preached about the imminent redemption to the eager masses. Amid the excitement were discussions regarding the rebuilding of the Temple and the recreation of the priestly garb. It was at this point a standstill was reached; how could the holy vestments be made without *tekhelet*? Rabbi Gershon Henoch Leiner, the Radziner Rebbe, assumed the responsibility of finding the lost ingredient and the animal from which it comes. He traveled to an aquarium in Naples to investigate a suggestion that the *chilazon* was the squid, *Sepia officinalis*, or as it is more commonly known, the cuttlefish. He consulted with the chemists of his town and found that its black ink secretions could be turned to blue. The

Talmudic descriptions of the anatomy of the *chilazon* and its blue dye now paralleled his discovery. In three treatises, *Sefunei Temunai Chol*, *Petil Tekhelet*, and *Ein HaTekhelet*, R' Leiner identified the *chilazon* as the cuttlefish.

In 1913, as part of his doctoral dissertation on *tekhelet*, Rabbi Isaac Herzog, Chief Rabbi of Dublin and subsequently Chief Rabbi of Israel, contacted eminent chemists and dye experts in Germany for an analysis of the *tekhelet* of the Radziner Rebbe. The shocking results showed that the deep blue was, in fact, an inorganic dye known as ferric ferrocyanide,  $\text{Fe}_7(\text{CN})_{18}$ , or Prussian blue. Upon request for the methods of *tekhelet* production used by the Radziner Chasidim, Rabbi Herzog noted that the ink was heated to very high temperatures and iron fillings were then added to the hot liquid. Through this procedure the organic molecules in the ink decomposed and the carbon and nitrogen atoms recombined with the iron, producing the deep blue pigment. Thus, the Radziner's *tekhelet* was not from the squid but from an inorganic substance that could be produced from the generic chemical reaction combining the atomic components of any number of molecules. Rabbi Herzog decided that the Radziner Rebbe's formula could not be true *tekhelet*, as the Talmud goes to great lengths to specify the requirement of a specific biological species. He proffered, instead, that the *chilazon* could be the *Janthina* snail [4].

In the mid-1800's, archaeologists unearthed several “factories” where dye was produced. Near these structures were large piles of snail shells, among them, the *Murex trunculus* [2]. Furthermore, recent chemical evidence has led scientists to believe that the *chilazon* is the *Murex trunculus* snail, which was used by the Phoenicians to dye their garments. The dye of the *Murex trunculus* goes through a series of transformations, from colorless to yellow to green to blue, and finally, to purple [5]. The presence of purple is very enigmatic, as *tekhelet* is purely indigo. In the 1980's Otto Elsner of the Shenkar College of Fibers investigated the ancient technique of exposing the dye to the sun. He and Ehud Spanier of Haifa University researched this method even further and found that when the *M. trunculus* dye is in a chemically reduced state and subsequently exposed to any form of ultraviolet light, the purple hue completely disappears. Thus, the dye would naturally reduce upon exposure to sunlight, which would explain the method of old [4].

The biochemistry of the *in vivo* dye production was later explained. The precursors of the dye are in the snail's hypobranchial gland as a clear, colorless liquid. Upon the liquid's exposure to air and sunlight, an enzyme known as purpurase converts it into the dye. The reaction produces a mixture of the blue indigo and the purple dibromoindigo. The sunlight causes the carbon-bromine bonds to break and the molecule is transformed into indigo, or *tekhelet*. Because of the rapid denaturation of purpurase, the gland must be squeezed immediately from the living mollusk, which is a criterion consistent with the *Gemara*'s description that the animal remain viable after the extraction of the dye [4].

Rabbi Dr. Moshe D. Tendler, *Shlita*, writes that though no single individual can testify that he has received a tradition as to the identity of the *chilazon* and *tekhelet*, the knowledge that has surfaced from research and investigation is almost incontrovertible.

Thus, "...the matter is equivalent to the testimony of two witnesses, whose word is sufficient to establish a matter" [2].

The complexity of the modern reestablishment of *tekhelet* is truly fascinating. It reflects the beautifully unwavering devotion of the Jew to *HaShem* and His commandments. The tireless efforts of those determined to find the *chilazon* and study the manufacture of its dye have hopefully contributed to the nearing of our final redemption. May we merit once again to see the *tekhelet*-colored constituents of the third and final Temple speedily in our days.

#### Acknowledgements:

I wish to thank Rav Mordecai Tendler, *Shlita*, for his continued guidance and meticulous review of this article. I also thank Dr. H. Babich, whose support and concern knows no bounds. Sincere appreciation is expressed to my parents for their constant direction and advice for this and many other publications.

#### References:

- [1] Feliks, J. (2007) *Tekhelet*. Encyclopaedia Judaica, 2<sup>nd</sup> Ed. Berenbaum, M. and Skolnik, F. (Eds.). Macmillan Reference USA, Detroit, MI. pp.586-587.
- [2] Kollel Iyun Hadaf of Har Nof. Thoughts on the Daily Daf. <http://www.dafyomi.co.il/> (retrieved January 12, 2009).
- [3] Tendler, M.D. (1996). Identifying *Tekhelet*: Masoret and Yedi'ah. *Tekhelet: The Renaissance of a Mitzvah*. Cohen, A. (Ed.). The Michael Scharf Publication Trust of Yeshiva University Press, New York, NY. pp. 39-50.
- [4] Stermann, B. (1996). The Science of *Tekhelet*. *Tekhelet: The Renaissance of a Mitzvah*. Cohen, Rabbi A. (Ed.). The Michael Scharf Publication Trust of Yeshiva University Press, New York, NY. pp. 63-78.
- [5] *Tekhelet Questions*. Ptil *Tekhelet* The Association for the Promotion and Distribution of *Tekhelet*. <http://tekhelet.com> (retrieved January 21, 2009).

## Academic year: 2008/2009

### Department of Biology, Department of Chemistry/Biochemistry, Department of Physics, and Department of Psychology

#### Graduating Seniors

Discipline	Number of students	Professional/graduate school
Allopathic medical school	19	AECOM; Mt. Sinai School of Medicine; Rush Medical College; Albany Medical College; Technion; Sat. George's University
Osteopathic medical school	1	Touro School of Osteopathic Medicine
Dental school	7	Columbia University; NYU; UMDNJ
Optometry	2	SUNY
Ph.D. - Biomedical Sci.	2	Sue Golding, AECOM
Ph.D. - Physics	2	Columbia University; Queens College (CUNY)
Ph.D./Psy.D - Psychology	2	Pace (School/Child Clinical PsyD)
Engineering	1	Columbia University
Physical therapy	8	UMDNJ; Downstate; Hunter; Touro; Emory University; Georgia State
Genetic counseling - M.S.	2	Sarah Lawrence
Nutrition - M.S.	3	NYU; Columbia University
Public Health - M.S.	1	UMDNJ
Biotechnology - M.S.	4	NYU; Columbia University

Occupational therapy 16 Columbia University; NYU; Seton Hall; SUNY Downstate; Touro

Discipline	Number of students	Professional/graduate school
Nursing	22	NYU: UMDNJ; Stony Brook: Columbia University; Duquesne University; University of Maryland
School psychology - M.A.	1	Queens College (CUNY)
Social work - M.A.	6	NYU; Hunter: Wurzweiler; University of Maryland
Clinical Child Psychology - M.A.	1	Tel Aviv Yaffo College

#### Summer 2009 - Internships

(also see: "Summer Research at the Albert Einstein College of Medicine")

Daniella Ahdout: Senator J. Beck

Avital Bauman: University Undergraduate Research Scholar, AECOM

Rachel Aviv: Cedars-Sinai Medical Center, Crohn's disease research (Dr. Ellen Kane)

Johanna Banoun: dental internship (Dr. Youdeem)

Alizza Berk: Department of Biology, SCW (Dr. J. Weisburg)

Amanda Bier: Department of Biology, SCW (Dr. J. Weisburg)

Tzivya Block: NYU Rusk Institute (HCOP), Occupational therapy

Malka Bromberg: Dr. Henry Kressel scholar, SCW Physics Department, NJIT and BNL (Dr. A. Frenkel)

Fay Burekhovich: Roth Scholar, AECOM

Barrie Cohen: Rutgers University-Yeshiva University Summer Undergraduate Research Program (RYSURP)

Tamar Cohen: Department of Neurosciences, AECOM (laboratory of Dr. Diane Lebesgue)

Chana Cooper: Department of Chemistry, SCW (Dr. S Kozlova)

Jennifer Deluty: PROP (Premed Research Opportunities Program), Mount Sinai Graduate School of Biological Studies

Amanda Douek: Ivymount School

Frieda Dukesz: Department of Physics, SCW (Dr. Lea Santos)

Judith Fischer: Department of Computer Science & Engineering, Hebrew University

Ilana Frankiel: Cedars-Sinai Medical Center, neurosurgery (Dr. John Yu)

Esther Frederick: Department of Chemistry/Biochemistry; SCW (Dr. E. Mintzer)

Tamara Freiden: St. Jude Children's Research Hospital, Infectious Diseases

Aliza Friedman: NYU Rusk Institute (HCOP), Physical therapy

Debbie Ganz: New York State Psychiatric Institute (Dr. Leo Sher)

Kayla Goldman: NYU Rusk Institute (HCOP), Occupational therapy

Zahava Goldofsky: LIJ Eating Disorder Clinic

Vivina Goldschmidt: Summer Undergraduate Research Fellowship, University of Texas - Southwestern.

Orli Haken: Nathan Schnaper Cancer Research Summer Intern Program, University of Maryland Greenebaum Cancer Center

Emily Harris: Beth Israel Medical Center (Dr. Michael Leitman)

Leora Hirsch: NYU Rusk Institute (HCOP), Occupational therapy

Nathalie Hirsch: NYU School of Medicine (Dr. Donington)

Tsipora Huisman: Anatomy and Structural Biology (Dr. Louis Hodgson), AECOM

Deborah Kammoun: Dental internship (Dr. M. Noorani)



Stephanie Kimmel: Lehigh Valley Hospital (Pennsylvania), Traumatic Brain Injury Unit

Rachel King: Beth Israel Medical Center, Endocrinology and Metabolism Laboratory (Dr. Seto-Young)

Caroline Kornhauser: Temple University, pharmacology (Dr. Scott Rawls)  
Hanna Kott: Balance Diagnostic Corporation

Jennifer Kraut: Dept. of Anatomy and Structural Biology, AECOM (laboratory of Dr. Peter Satir)

Aimee Krausz: Department of Neuroradiology, AECOM (Dr. Michael Lipton)

Rivky Kuperman: Columbia University, Developmental Neuropsychiatry (Dr. A. Whitaker)

Amy LeVee: Department of Physics, SCW (Dr. E. Prodan)

Emily Liebling: University Undergraduate Research Scholar, AECOM

Chana Gila (Ovits) Levy: Department of Biology, SCW (Drs. H. Babich & A.G. Schuck)

Hadassa Klerman: Department of Cell Biology, Harvard Medical School (laboratory of Dr. Tomer Avidor-Reiss)

Aimee Krausz: AECOM

Adina Maik: Robert Wood Johnson Medical School's Summer Clinical Internship Program.

Debra Mandelbaum: Dorfman Dental Associates, NY Cosmetic & Specialty Dental Group

Julie Meir: iGEM program in synthetic biology, Yeshiva University, (Dr. Machczynski)

Rena Miller: Veteran's Affairs Medical Center

Eveline Mordehai: Dr. Perry Robbins (Dermatology office)

Rachel Nemzer: Artistic Quality Therapy Associates

Marina Pekar: Department of Biology, SCW (Dr. M. Vigodner)

Elizabeth Penn: Henry Ittleson Day Treatment Center

Malka Perelman: Undergraduate Research Program, Baylor School of Natural and Environmental Sciences

Chava Ruderman: Roth Scholar, AECOM

Lori Schonbrun: Department of Chemistry/Biochemistry, SCW (Dr. C. Rapp):

Rebecca Segal: Department of Physics, SCW and Brookhaven National Laboratory (Dr. A. Frenkel)

Leah Schweitzer: University of Ottawa Heart Institute, Cardiovascular Genetics Research Centre

Avielle Shachter: Department of Biology, SCW (Dr. M. Holz)

Eliana Shaul: Montreal Jewish General Hospital, McGill University (Cell Biology)

Loriel (Leah) Solodokin: Department of Biology, SCW (Drs. H. Babich & A.G. Schuck)

Avigail Soloveichik: LIJ Hospital

Tirtza Spiegel: Roth Scholar, AECOM

Danielle Taylor: Department of Psychology, SCW (Dr. Lauren Harburger)

Aviva Tobin-Hess: Long Island Jewish Medical Center, Electrophysiology research

Jessica Tugetman: AECOM

Rivka Warburg: Columbia University Medical Center (Dr. Y. Stern); NYSPI (Dr. D. Mandell)

Deena Wasserman: Children's Hospital of Pittsburg, pathogenesis of NCT Disease (Dr. David Hackam)

Rebecca Weiss: SERC Scholar: AECOM

Nava Wexler: NYU Rusk Institute (HCOP), Psychological Research; CUNY (Dr. H. Saltstein)

Rivka Weyl: Toronto Western Hospital, Tourette's Syndrome Clinic

Marina Zilbergerts: Department of Physics, SCW (Dr. L. Santos)

Shoshana Zitter: Roth Scholar, AECOM

Stephanie Kimmel: Lehigh Valley Hospital (Pennsylvania), Traumatic Brain Injury Unit

Rachel King: Beth Israel Medical Center, Endocrinology and Metabolism Laboratory  
(Dr. Seto-Young)

Caroline Kornhauser: Temple University, pharmacology (Dr. Scott Rawls)  
Hanna Kott: Balance Diagnostic Corporation

Jennifer Kraut: Dept. of Anatomy and Structural Biology, AECOM (laboratory of  
Dr. Peter Satir)

Aimee Krausz: Department of Neuroradiology, AECOM (Dr. Michael Lipton)

Rivky Kuperman: Columbia University, Developmental Neuropsychiatry  
(Dr. A. Whitaker)

Amy LeVee: Department of Physics, SCW (Dr. E. Prodan)

Emily Liebling: University Undergraduate Research Scholar, AECOM

Chana Gila (Ovits) Levy: Department of Biology, SCW (Drs. H. Babich & A.G. Schuck)

Hadassa Klerman: Department of Cell Biology, Harvard Medical School (laboratory of  
Dr. Tomer Avidor-Reiss)

Aimee Krausz: AECOM

Adina Maik: Robert Wood Johnson Medical School's Summer Clinical Internship  
Program.

Debra Mandelbaum: Dorfman Dental Associates, NY Cosmetic & Specialty Dental  
Group

Julie Meir: iGEM program in synthetic biology, Yeshiva University, (Dr. Machczynski)

Rena Miller: Veteran's Affairs Medical Center

Eveline Mordehai: Dr. Perry Robbins (Dermatology office)

Rachel Nemzer: Artistic Quality Therapy Associates

Marina Pekar: Department of Biology, SCW (Dr. M. Vigodner)

Elizabeth Penn: Henry Ittleson Day Treatment Center

Malka Perelman: Undergraduate Research Program, Baylor School of Natural and  
Environmental Sciences

Chava Ruderman: Roth Scholar, AECOM

Lori Schonbrun: Department of Chemistry/Biochemistry, SCW (Dr. C. Rapp):

Rebecca Segal: Department of Physics, SCW and Brookhaven National Laboratory  
(Dr. A. Frenkel)

Leah Schweitzer: University of Ottawa Heart Institute, Cardiovascular Genetics Research  
Centre

Avielle Shachter: Department of Biology, SCW (Dr. M. Holz)

Eliana Shaul: Montreal Jewish General Hospital, McGill University (Cell Biology)

Lori (Leah) Solodokin: Department of Biology, SCW (Drs. H. Babich & A.G. Schuck)

Avigail Soloveichik: LIJ Hospital

Tirtza Spiegel: Roth Scholar, AECOM

Danielle Taylor: Department of Psychology, SCW (Dr. Lauren Harburger)

Aviva Tobin-Hess: Long Island Jewish Medical Center, Electrophysiology research

Jessica Tugetman: AECOM

Rivka Warburg: Columbia University Medical Center (Dr. Y. Stern); NYSPI  
(Dr. D. Mandell)

Deena Wasserman: Children's Hospital of Pittsburgh, pathogenesis of NCT Disease  
(Dr. David Hackam)

Rebecca Weiss: SERC Scholar: AECOM

Nava Wexler: NYU Rusk Institute (HCOP), Psychological Research; CUNY  
(Dr. H. Saltzstein)

Rivka Weyl: Toronto Western Hospital, Tourette's Syndrome Clinic

Marina Zilbergerts: Department of Physics, SCW (Dr. L. Santos)

Shoshana Zitter: Roth Scholar, AECOM

## Student Publications and Presentations

### Scientific Journals

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

- Babich, H., **Akerman, N.J., Burekhovich, F.**, Zuckerbraun, H.L., and A.G. Schuck, 2009, *Ginkgo biloba* leaf extract induces oxidative stress in carcinoma HSC-2 cells, *Toxicol. In Vitro* (in press).
- 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: *g-Al<sub>2</sub>O<sub>3</sub>*, *J. Am. Chem. Soc.* (in press).
- 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* (in press).
- Hathaway, F., **Burns, E.**, and Ostrer, H., 2009, Consumers' desire towards current and prospective reproductive genetic testing, *J. Genet. Couns.* (in press).
- 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.* (in press).
- 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 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.
- 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 SrTiO<sub>3</sub>, *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. Weinerman**, 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., Rodriguez, 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., Brew, 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, *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 polyoxomolybdenum 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., Wurzbarger, 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., Wurzbarger, 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, dichlorone, 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

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, 1<sup>st</sup> 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, Ginkgo biloba leaf extract induces oxidative stress in HSC-2 carcinoma cells, Columbia University Symposium of Undergraduate Research, Spring. (abstract and oral presentation).

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

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

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

**Herzberg, B.M., Ting, L.-M., Mwakingwe, A., Croken, M.M., Madrid, D., Hochman, S., and K. Kim**, 2009, Genetic studies of adenosine deaminase in the rodent malaria parasites, *Plasmodium yoelii* and *Plasmodium berghei*, The 237<sup>th</sup> 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 237<sup>th</sup> 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 237<sup>th</sup> 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, 233<sup>rd</sup> American Chemical Society National Meeting, Chicago, IL. (poster presentation/abstract).

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

**Brodth, 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, 233<sup>rd</sup> 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., Ribber, 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., Brewe, D., Abitbol, N., and O. Odom, 2006,** *Performance and improved design of the log spiral of revolution monochromator*, XAFS13 Conference, Stanford, CA.

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

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

**Zaghi, D., Jacobson, M., and G. Barreiro, 2006,** pH Sensitivity in talin, 232<sup>nd</sup> 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, 231<sup>st</sup> 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, 231<sup>st</sup> 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*, 231<sup>st</sup> 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, 231<sup>st</sup> 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, 231<sup>st</sup> 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, 229<sup>th</sup> 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, 229<sup>th</sup> 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, 229<sup>th</sup> 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, 229<sup>th</sup> 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, 227<sup>th</sup> National Meeting of the American Chemical Society, Anaheim, CA.

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

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

**Suttner, S., Sukhu, B., and H.C. Tenenbaum,** 2004, Effect of the inflammatory cytokine (IL)-1β on osteoclast formation and function in human umbilical cord blood cells, 228<sup>th</sup> 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, 228<sup>th</sup> 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, 225<sup>th</sup> National Meeting of the American Chemical Society, New Orleans, LA

**Sedletcaia, A.** and P. Cohen, 2003, Localization of PMS2 in meiotic cells, 225<sup>th</sup> 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, 225<sup>th</sup> 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*, 226<sup>th</sup> 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, 36<sup>th</sup> Middle Atlantic Regional Meeting of the American Chemical Society, Princeton, NJ

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

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

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

**Nivasch, R.,** Chill, J. and J. Anglistter, 2002, NMR-based homology model of the interferon  $\alpha$  receptor, 2002, 223<sup>rd</sup> 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, 223<sup>rd</sup> National Meeting of the American Chemical Society, Orlando, FL.

**Sedletcaia, E.** Matthiesen, S.H. and B.H. Sator, 2002, Parafusion homologue in *Tetrahymena thermophila*, 223<sup>rd</sup> 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, 221<sup>st</sup> National Meeting of the American Chemical Society, San Diego, 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, 221<sup>st</sup> 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, 219<sup>th</sup> 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, 219<sup>th</sup> 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, 217<sup>th</sup> 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, 217<sup>th</sup> National Meeting of the American Chemical Society, Anaheim, CA.

**Feig, J.S.,** Cleary, J., and B. Diamond, 1999, Detection of estrogen receptor  $\alpha$  mRNA in B and T cell lines by reverse transcriptase chain reaction, 217<sup>th</sup> National Meeting of the American Chemical Society, Anaheim, CA.

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

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



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

Blau, L., Stern R.B., Wun, T.C., and R. Bittman, 1984, Calcium transport across phosphatidylcholine vesicles, 8<sup>th</sup> 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

## Science and Ethics: A Joint Perspective

The underlying theme of this journal is the integration of Torah, science, and bioethics. The goal is to demonstrate how Judaism effectively and eloquently addresses difficult ethical issues raised by the surging advances in the biomedical sciences. The articles, written and edited by the students of Stern College for Women, attempt to analyze these bioethical issues from both Torah and classical bioethics perspectives. At times, views of other major religions are presented as well. Comparisons and contrasts between the Torah's views and those of classical bioethics, and other religions, are essential components of the journal. Issues relating to genetics technology, organ donation, assisted reproductive technology, end-of-life care and other real life clinical challenges are discussed. The first volume was published in Spring 2006. Rabbi Richard Weiss serves as the faculty adviser.

### Volume 4 (2009)

- Herzberg, B.M., Human experimentation in twentieth century America, pp. 1-14.  
Fischer, Y., Medical ethics in a time of war, pp. 15-28.  
Digilova, A., Should the HPV vaccine be mandatory? pp. 29-40.  
Lent, D., A sporting dilemma: what is cheating? pp. 41-52.  
Spiegel, T., Practicing preventive oncology: *halachic* problems and preferences regarding the BRCA gene, pp. 53-60.  
Press, A., Informed consent, pp. 61-66.  
Cohen, B., Animal research: a necessary evil, pp. 67-76.  
Weiss, R., The right to bear children, pp. 77-84.

### Volume 3 (2008)

- Fischer, Y., The shortcomings of height enhancement, pp. 3-22.  
Spiegel, T., The separation of conjoined twins, pp. 23-32.  
Burekhovich, F., Autopsies, pp. 33-46.  
Digilova, A., Maternal-fetal conflict, pp. 47-56.  
Raviv, T., Should the sale of organs be legalized? pp. 57-66.  
Lichtman, S., True beauty, pp. 67-85.  
Weiss, R., Paternal rights to refuse treatment for children, pp. 86-93.

### Volume 2 (2007)

- Marmor, R., Three responses to the Bodies' Exhibit, pp. 3-16.  
Cohen, A., Animal experimentation, pp. 17-37.  
Gottesman, R., Surrogate motherhood, pp. 38-49.  
Barenboim, D., Belief and medicine, pp. 50-65.  
Stromer, G., How old is too old? pp. 66-74.  
Amzallag, C., Euthanasia, pp. 75-82.  
Weiss, R., Negligent behavior and the right to medical treatment, pp. 83-95.

- Alkoby, J., The ethics of conjoined twins, pp. 4-16.  
Fischer, C., Gender selection, pp. 17-30.  
Goldberg, M., Perspectives on genetic therapy, pp. 31-46.  
Kahn-Rose, A., Euthanasia, pp. 47-54.  
Muskin, E. and Weisbord, M., Human research and clinical trials, pp. 55-77.  
Pinsky, S., Human reproductive cloning, pp. 78-102.  
Sinensky, R., Organ donation, pp. 103-109.  
Yamnik, R., Artificial insemination, pp. 110-117.  
Weiss, R., Do not resuscitate in slow motion: a Jewish perspective, pp. 118-125.

## Should HPV Vaccine be Mandatory? (reprinted from volume 4)

By Alla Digilova

Advances in the medical field enable human beings to better protect themselves against infection. Development of vaccines has long been one of the most intensively researched areas in science. Though generally welcomed as vital signs of progress in treatment and prevention of disease, new vaccines are initially subjected to public scrutiny and debate before they become widely accepted or even mandated. Recently introduced into the market, the vaccine against genital human papillomavirus (HPV) has incited much controversy that ultimately led to an ethical debate on whether mandating the vaccine should be considered an option.

### Demographics

Genital human papillomavirus (HPV) is one of the most common sexually transmitted infections (STI) that infects the skin and mucous membranes. There exist about 40 different types of genital HPV, that are categorized as low-risk or high-risk depending on the type of conditions they may ultimately cause. Most people that are infected with genital HPV do not display any symptoms, compounding the problem of spreading the infection, since infected people may not know that they are in fact carrying the disease. In about 90 percent of cases, the body's immune system will clear the virus out of the body in a two year time frame. However, in some cases immune protection fails. In such an event, low-risk types of genital HPV cause the appearance of genital warts, and high-risk genital HPV may lead to the development of cervical cancer. The virus has also been linked to causing several other types of cancers in both males and females<sup>1</sup>.

According to the most recent data released by the Center of the Disease Control and Prevention, about 20 million Americans are currently infected with the virus. By 50 years of age, about 70-80% will have become infected with at least one strain of genital HPV. The number of infected people grows everyday, with an estimate of 6.2 million new infections a year. Once HPV virus infects an individual, the infection can't be treated<sup>1</sup>.

Gardasil and Cervarix, two HPV vaccines, are currently under development in the United States. The vaccines defend against four types of HPV that cause genital warts and cervical cancer. Among these four types are types 16 and 18 which cause about 70% of cervical cancer cases. One of the vaccines, Gardasil, was approved by FDA in 2006. The Center for Disease Control, supported by the American Academy of Pediatrics, made a universal recommendation for vaccination of girls at ages 11-12 (usually before the onset of any sexual activity). Females in age group 9-26, however, also make good candidates for receiving the vaccine<sup>1</sup>.

## Arguments For and Against Mandating the Vaccine

In light of the growing number of cases of infection, a vaccine against genital HPV may initially appear as a blessing that should be welcomed by everyone. However, fears of social stigmas, and traditional and some medical considerations hinder individuals' decision to choose vaccination. The problem is aggravated by proposals of some states to introduce mandatory vaccination for school girls. Fueling the debate, beginning in 2006, at least 41 states and the District of Columbia have tried to introduce legislations that requires vaccination and/or served to increase public awareness and understanding of the vaccine. Of these 41 states, 19 have enacted the bills. In 2007, 24 states had introduced legislations that specifically mandate HPV vaccination in order to be admitted to school<sup>2</sup>.

Despite the governmental efforts and mandates, the idea of compulsory vaccination has been met with strong opposition. Many religious Christian groups oppose the idea of making sex safer for teenagers, due to their belief that abstinence is the only truly safe way that should be promoted<sup>3</sup>. Groups such as Family Research Council and Focus on the Family support the availability of the vaccine but vehemently oppose making it mandatory for school attendance<sup>4</sup>. The opinions of these groups manifest concerns felt by many parents. Such a response is a reflection of complex ethical issues involved with mandatory vaccination against genital HPV.

One group of opponents of mandatory vaccination against genital HPV bases its arguments on the nature of the viral infection. Vaccination against genital HPV is potentially different from previously mandated vaccines since the virus is sexually transmitted. Thus, many parents are concerned, perhaps rightfully, that administration of the vaccine may give an impression to their daughters that the vaccine gives them more freedom in engaging in risky sexual behavior. The vaccine, however, doesn't protect the girls from other sexually transmitted viruses, some of which have deadlier consequences, as in the case of HIV. Genital HPV is only one of the many viruses that are sexually transmitted and this vaccination against it should not be seen as panacea. Therefore, if immunization is coupled with information session regarding the results vaccination will achieve and the effects that aren't within its scope, the problem of negatively influencing the girl's sexual behavior may perhaps be resolved. However, since human behavior is not always rational, especially in the case of young females, there is no way to completely refute or support the claims on one or another side of the argument.

If the girl is not even planning to engage in risky behavior, is it fair to say that she is not in the need of the vaccine? Such thinking leads many traditional families to not administer the vaccine to their daughters. Social stigmas still exist and affect human behavior, as can be seen from a recent California study. Even though about 75% of parents would like to immunize their daughters before the age of 13, 25% are not ready to undertake such a step. Among the issues cited by the latter group are "concerns that vaccination might influence their daughter's sexual behaviors, their uneasiness about the morality of immunizing to prevent sexually transmitted infections, and worries about the safety of the vaccine"<sup>1</sup>.

Previously enacted mandates do not provide compelling insights with regard to the controversy. The only other largely sexually transmitted disease against which vaccination is required in most states is Hepatitis B. Proponents of the vaccine therefore cite Hepatitis B vaccination as a model. The case of Hepatitis B, however, is not a direct parallel to genital HPV vaccine, since as many as 30% of Hepatitis B infections are transmitted by ways other than sexual contact. Therefore this virus is not generally perceived as a "risky sexual behavior disease." Still, other proponents of the vaccine compare HPV vaccination to infant car seats and bicycle helmets that are both legally required in some states. Supporters of mandatory vaccination cite examples of these mandates as previously passed laws that do not necessarily affect all minors but are passed for the protectoral benefit of all minors<sup>5</sup>. They therefore claim that though HPV vaccine may be less needed for girls who are not at "risk," (as some religious or traditional parents believe), they should be vaccinated since the law is passed for all children, not only for those who will engage in risky behaviors. While there is an ostensible similarity between these two groups of mandates, the argument has little rational value, since they deal with different types of laws. The laws are not passed for one individual at all times. Rather, the laws are passed to establish a system of regulations for society as a whole. Mandatory helmets only affect children who ride bicycles, just like compulsory seat belts affect only the children whose parents drive them in cars. Mandatory vaccination, however, will affect all girls, regardless of whether or not they are less or more in need of the vaccine.

The discussion of whether certain young girls are less or more in need of the vaccine is favored on the basis of the unsound distinction. Young women that are less likely to engage in risky sexual behavior *are not* in less need of the vaccine. Though socially perceived as viruses that are more likely to affect more sexually careless individuals, sexually transmitted viruses can infect anyone. No one is guaranteed knowledge of the sexual history of his or her partner, even members of religious or traditional communities. In fact, in traditional communities, where women may not feel as independent and as the result wouldn't inquire into their partner's sexual history, not receiving a vaccine makes women even more vulnerable to infection in comparison to other females who would be vaccinated before their first sexual contact. Mandating the vaccine may therefore be seen as a government-imposed protection for all girls.

### Larger Concerns

Another questions raised by mandating the vaccine is whether such an act would improve or worsen the situation of existing health care disparities. Among one of the primary considerations to be considered is the cost of the vaccinations. The current prices equilibrate around \$120 per dose. Three dose series are necessary for the vaccine to be most effective, corresponding to three health care visits needed for the immunization. Though some insurance companies cover the costs of the vaccine and doctor's visits, others don't. In fact there has been major opposition from the companies who are unwilling to cover the cost of the vaccine<sup>6</sup>. Moreover not every family has health insurance, and not every parent can easily take days off or have someone escort his or her

child to a doctor's office three times. Research into demographical data on the women infected demonstrated that poorer women are more likely to get infected with genital HPV and are more likely to develop cervical cancer<sup>1</sup>. If this segment of population is the one that suffers the most, making a vaccine mandatory from one point of view may seem to only aggravate the problem of vaccine-associated disparities. Is it at all ethical to pass a law mandating an expensive vaccine that the most affected population may not be able to afford? If one bases his answer on the current situation with health insurance companies coverage of the costs, then perhaps the answer is no. If, however, health care disparities are defined on the basis of the treatments received by different segments of society and not the difficulties in obtaining this treatment, then perhaps mandatory vaccination would eliminate the problem of vaccine-associated disparities. Moreover, the situation with health insurance companies might change if the vaccine becomes mandatory. More companies may start to cover the costs of the vaccination once genital HPV vaccine becomes a compulsory component of immunization. Unfortunately, one can't predict the behavior of insurance companies and passing a law based on future expectations may not be reasonable.

Mandatory vaccination raises other questions regarding the possible effects of the vaccine. The question is raised whether immunization would stop young women from regular cervical cancer screening programs. Even after the vaccination, women should undergo regular Pap tests. The vaccinated group may start believing that by obtaining immunization they are no longer at risk. Such belief is erroneous, however, since the vaccine only protects from four types of HPV. There still remain other high-risk types of HPV that can cause the development of cervical cancer. Yet, as of now there is little research conducted in this area and the argument can't be either confirmed or refuted<sup>5</sup>.

Still others ask regarding the legitimacy of the claim that universal immunization would reduce the risk of transmission of the strains of HPV against which the vaccine protects. There is yet no data collected on this question due to the novelty of the vaccine. Because the vaccine prevents the four types of otherwise persistent HPV infections, the universal transmission may decrease. However, in absence of similar vaccination program for males, vaccination of females only may not have a noticeable impact on public health<sup>5</sup>.

Lastly, as in the case of many new treatments, there remains a concern regarding possible adverse effects of the vaccine. Due to little public experience with the treatment, no clinical research has yet been done, since no sufficient data has been accumulated. Thus we cannot yet establish whether there are possible serious side effects implied with obtaining the vaccination.

### The Jewish Perspective

The issue of adverse effects of HPV vaccination is of primary concern in examining the implications such vaccination has in Jewish law. Immunization with the

newly developed vaccine falls into the general category of choice between: "shev v'al taaseh" - sitting and not acting -- versus "kum v'aseh" -- choosing the proactive response. The general rule in such questions is "if the outcome of action versus inaction each has a significant downside, we opt for inaction"<sup>7</sup>. This holds true if action and inaction carry risks of equal magnitude. However, in cases, when risks imposed from inaction are greater we chose the action mode.

Based on the action versus inaction model, Jewish law allows vaccination even if there exists a small risk of death from the vaccine. The ruling was even implemented in practice in 19<sup>th</sup> century, when Rabbi Yisroel Lipshutz allowed vaccination against smallpox. The case of smallpox, however, is different from HPV since the latter is not an easily spread contagious disease, but a sexually transmitted virus. Thus, one can argue that the risk of infection is not as large as was the case with smallpox. On the other hand, though we can't assess the full picture of side effects, laboratory studies demonstrate that the health risks implied by HPV vaccination are much smaller than the dangers posed by the virus. Therefore, the question of whether the risks of HPV vaccine outweigh its benefits remains unresolved until more clinical data is available.

What remains to be examined is the opinion of Jewish law on mandatory vaccination. As a general rule, Judaism recognizes the benefits imposed by universal vaccination, while honoring individual decisions. This standpoint gave rise to different opposing interpretations. Rabbi Sholom Kamenetsky, of the Talmudical Yeshiva of Philadelphia explains that society can mandate immunization despite the possibility of rare serious complications. However, one can refuse immunization, as long as such refusal wouldn't pose a public health risk. In the case that a large enough number of people refuse vaccination thus causing a public health risk, the government may require everyone to be immunized. Jewish legal expert, Rabbi Eliezer Yehuda Waldenberg agrees that preventative medical treatments may be mandated. However, Rabbi Yehoshua Neuwirth, a major contemporary Israeli posek has a different opinion about the extent to which society can mandate a treatment. According Rabbi Neuwirth: "One may not obligate any healthy person to receive treatment as a preventive measure. Although one may try to convince the individual, he may do no more. If there was absolute evidence that [an individual] could be a danger to others, such as in spreading infection which could be fatal, then there would be a case for forcing him to have a vaccine, but only if it was certain that the vaccine itself was not dangerous to him"<sup>7</sup>.

### Conclusion

In light of opposing opinions about HPV vaccination from ethical, legal, and Jewish perspectives the question of mandatory immunization remains quite controversial. The problem is exacerbated by the novelty of the vaccine, since at this stage society can't clearly assess the extent of risks and benefits implied by the treatment. Therefore, more data accumulation and more time are necessary for the concerns to be properly evaluated.

## Works Cited

- [1] "Genital HPV Infection: CDC Fact Sheet." Department of Health and Human Services: Center for Disease Control and Prevention (CDC). 2008.  
<<http://www.cdc.gov/std/HPV/STDFact-HPV.htm>>.
- [2] "HPV Vaccine." National Conference of State Legislations (NCSL). 2008.  
<<http://www.ncsl.org/programs/health/HPVvaccine.htm>>.
- [3] Robinson, B. "Objections to and Acceptance of, Gardasil® HPV vaccine." Ontario Consultants on Religious Tolerance. 21 January 2007.  
<<http://www.religioustolerance.org/ccvac cine3.htm>>.
- [4] Sprigg, P. "Pro-Family, Pro-Vaccine — But Keep It Voluntary". The Washington Post. <<http://www.washingtonpost.com/wp-dyn/content/article/2006/07/14/AR2006071401532.html>>
- [5] "HPV Vaccines: Mandatory HPV Immunization for Middle School Girls." 2008. National Network for Immunization Information (NNII).
- [6] Fayed, L. "Why Your Doctor Doesn't Offer the HPV Vaccine?" Health Disease and Condition. About.com: Cancer. 11 July 2007.  
<<http://cancer.about.com/od/hpvvaccine/a/drvaccine.htm>>
- [7] Eisenberg, D. "The Ethics of Smallpox Immunization." Science and Medical. Aish HaTorah.  
<[http://www.aish.com/societyWork/sciencenature/The\\_Ethics\\_of\\_Smallpox\\_Immunization.asp](http://www.aish.com/societyWork/sciencenature/The_Ethics_of_Smallpox_Immunization.asp)>  
2009.

# ABSTRACT BOOKLET of STUDENT RESEARCH - 2009

Stern College for Women  
Yeshiva University

Department of Biology  
Department of Chemistry/Biochemistry  
Department of Physics  
Department of Psychology

Co-editors

Fay Burekhovich  
Aviva Schiffmiller  
Hadassah Shulman  
Danielle Taylor



## Endocannabinoid protein expression in human immunodeficiency virus encephalitis

By: Avital Bauman<sup>1,2</sup>, Meng-Liang Zhao<sup>2</sup>, Susan Morgello<sup>4</sup>, Sunhee C. Lee<sup>2</sup> and Melissa A. Cosenza-Nashat<sup>2,3</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY; <sup>2</sup>Department of Pathology, Albert Einstein College of Medicine, Bronx, NY; <sup>3</sup>Department of Science, Borough of Manhattan Community College, New York, NY; <sup>4</sup>Departments of Pathology and Neuroscience, Mount Sinai Medical Center, New York, NY

Cannabinoid receptors 1 and 2 (CB1 and CB2, respectively) are part of the endocannabinoid system along with intracellular enzymes (such as fatty acid amide hydrolase, FAAH) that degrade endocannabinoid ligands. Exogenous cannabinoids are potential therapeutics for treating neurological sequelae in HIV-infected patients because cannabinoids can suppress the immune system. Human immunodeficiency virus encephalitis (HIVE) is a pathological correlate to HIV-associated dementia, a condition that occurs in some HIV-infected individuals. Recently, Benito et. al. reported that CB2 receptors are upregulated in simian immunodeficiency virus encephalitis, a model for HIVE. We therefore sought to explore endocannabinoid protein expression in HIVE. We obtained paraffin-embedded human autopsy brain tissue sections from the National NeuroAIDS Tissue Consortium and divided them into four groups, HIV-seronegative (HIV-, n = 6, HIV-seropositive without brain pathology (HIV+, n = 12), HIV-seropositive with encephalitis (HIVE, n = 4) and HIV+ with co-infections/co-morbidities (HIV+/Coinfection, n = 5). Tissue sections were subjected to immunohistochemistry with several antibodies: anti-CB1, anti-CB2 and anti-FAAH. Immunolabeled sections were analyzed with microscopy and analysis of digital images was performed. Results indicate that CB1 and FAAH are present in neurons in all cases, while white matter CB1 staining in HIVE and HIV+/Coinfection cases was significantly above control levels. CB1 is upregulated in glia and perivascular macrophages based on morphology. Staining for CB2 illustrated immunoreactive perivascular macrophages, astrocytes and some microglia. Our results indicate that cannabinoid receptors are strongly expressed in HIVE brains and this may inform clinicians who are considering cannabinoids as adjunctive therapies for HIV-associated neurologic disorders.

## The association between feminism, religiosity, and psychological well-being in Jewish women

By: A. Bellman and T. DiLorenzo.

Stern College for Women, Yeshiva University, New York, NY 10016

Feminism has been shown to relate positively to well-being in women. Well-being has also been consistently related to religiosity. However, research examining the association between religion and feminism is inconsistent. Moreover, no study has examined the interrelations between feminism, religiosity and well-being in Orthodox Jewish women. Given the more traditional views and roles of women in this religious affiliation, we proposed that Orthodox Jewish women would have lower rates of feminism than non-denominational samples and that, consistent with prior literature, religiosity would be associated with well-being. However, we predicted that at high levels of religiosity, the association between feminism and well-being would be attenuated. Sixty-eight undergraduates from an Orthodox-affiliated University completed measures of feminist identity, feminist attitudes, religiosity, and psychological well-being. Results confirmed our hypothesis that women in our sample were less likely to identify as feminists than those in non-denominational samples ( $p < .01$ ). Results also showed that feminist identity and attitudes negatively predicted certain indicators of well-being (autonomy, environmental mastery, self-acceptance, purpose in life, personal growth, and positive relations with others). Overall, our results suggest that harboring a feminist identity and or attitudes may cause distress for women in an Orthodox subculture which may negatively evaluate feminism. This suggests that an assessment of women's well-being needs to be taken within specific cultural contexts.

## Novel biosensor for Cdc42 – N-WASP interaction, based on solvatochromic dyes

By: Fay Burekhovich<sup>1</sup> and Louis Hodgson<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Gruss-Lipper Biophotonics Center, Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY 10461

Cdc42, a member of Rho-family GTPase, regulates critical cellular functions including cell polarity maintenance and actin cytoskeleton rearrangement. Interaction of Cdc42 with one of its key downstream effectors, neuronal isoform of Wiskott Aldrich Syndrome Protein (N-WASP), has important implications with respect to cancer, where Cdc42-N-WASP binding plays a principal role in the establishment and function of invadopodia, invasive membrane extensions with matrix degrading activity vital for metastatic invasion of carcinoma cells. Studies utilizing fluorescent biosensors in live cancer cells have shown that N-WASP is active only at invadopodia, and does not impact normal cellular operations. Thus, inhibiting Cdc42-N-WASP interaction could be useful as a possible anti-metastatic therapy.

Based on previous research that detected endogenous Cdc42 activation in living cells by its binding to the Cdc42 binding domain (CBD) of hematopoietic WASP, we designed a new biosensor that uses the GTPase binding domain (GBD) of N-WASP. The derivatized GBD is attached to a solvent-sensitive dye that undergoes a great change in fluorescence emission intensity upon binding to activated, endogenous Cdc42. The new probe will be valuable in development of potential approaches for high-throughput screening of inhibitor libraries targeting Cdc42-N-WASP interaction, while minimizing spurious inhibition of hematopoietic WASP. Using recombinant DNA techniques, a novel biosensor for Cdc42-N-WASP interaction was produced and characterized in vitro.

## Neuronal differentiation of H9 human embryonic stem cells

By: Barrie Cohen<sup>1</sup>, Mohita Singh<sup>2</sup>, Joanne Babiarz<sup>3</sup>, Jennifer Moore<sup>3</sup> Ph.D. and Martin Grumet<sup>3</sup> Ph.D.

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY; <sup>2</sup>Colgate University, Hamilton, NY; <sup>3</sup>Rutgers Stem Cell Research Center, Rutgers, The State University of NJ

Human embryonic stem cells (hESC) have immense potential in many different areas of health and medicine, such as disease models for drug therapy and models for human development. Pluripotent stem cells have the ability to differentiate into all cell types whereas neural stem cells (NSCs) are restricted to a neural fate but maintain the capability to become any neural cell. We hypothesize that we can obtain neurons from hESC via a two-step process: differentiating hESC into NSCs and then into neurons. During this process, the NSC markers Sox 2 and Nestin are expected to decrease while the neuronal marker TuJ1 increases. The two-step differentiation protocol uses neural proliferation media containing FGF for proliferation of the NSCs, followed by incubation in neuronal differentiation media with BDNF (brain derived neurotrophic factor), to promote neuronal differentiation as opposed to glial differentiation. Over four weeks, the NSC markers Sox 2 and Nestin significantly decreased, while TuJ1 significantly increased. Further staining with MAP2 confirmed the presence of mature neurons, while GFAP, a marker for glia, showed a very small population of astroglial cells. Together, this information suggests that our protocol was successful in obtaining mostly neurons. Additional staining for neuronal subtype markers (VACHT, GAD65/67, VGAT, VGLUT) produced inconclusive results and experiments are ongoing to determine specific neuronal subtype differentiation. In conclusion, this protocol differentiates H9 hESC preferentially into neurons over glial cells.

## Dredged sediment as concrete filler and its effect on efflorescence

By: Chana Cooper and Sofiya Kozlova

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

In attempt to address the environmental concern posed by the disposal of dredged sediment, numerous studies have been done to discover its potential beneficial uses. Previous research demonstrated that after proper treatment, dredged sediment could potentially be utilized as concrete filler. The goal of this research is to further investigate the behavior of dredged sediment as filler and its effect on efflorescence.

One of the primary purposes of concrete filler is to prevent the deterioration of concrete by filling in the spaces in between the particles of the concrete mixture, thus minimizing the amount of pores and fissures within the structure. If the filler does not fully succeed, then water is able to enter the pores and dissolve and transport salts through the concrete, bringing them to the surface. The water evaporates, leaving salt deposits on the surface of the concrete called efflorescence. Research previously conducted by Columbia University demonstrated that the filler from treated dredged sediment was able to prevent efflorescence (Fig. 1). To investigate this ability of dredged sediment filler, it is imperative to examine the interactions between dredged sediment filler and the salts in the pores of the concrete structure. This research focuses primarily on sulfate efflorescence and the interaction between dredged sediment filler and the sulfate salts present in concrete structures in comparison with other fillers. FT-IR spectroscopy will be used to determine these interactions as they would occur in the pores of concrete.

Two solutions were prepared with lower and higher concentrations of sulfate salts. Solution 1, solution 2 and water were each mixed with a sample of dredged sediment filler, sand and kaolin, giving a total of 9 samples. The samples were allowed to sit for periods of 5, 12 and 20 days. At the end of each time period, portions of each sample were washed with water, filtrated, heated until dry and then tested through FT-IR spectroscopy.

The spectra of calcium sulfate dihydrate and magnesium sulfate heptahydrate were obtained for comparison purposes (Fig. 2). The peaks present in the 4000-3000  $\text{cm}^{-1}$  range and the 1700-1600  $\text{cm}^{-1}$  range are due to the presence of water molecules. The 1108  $\text{cm}^{-1}$ , 1058  $\text{cm}^{-1}$  and 982  $\text{cm}^{-1}$  peaks are related to the sulfates. If chemical sorption of the hydrated sulfates occurs in the tested materials then the peaks due to sulfates and water will appear, or, if they are already present, increase in intensity.

The IR spectra obtained from dredged sediment filler, sand and kaolin demonstrated no evidence of chemical interactions with the sulfate salts. In the dredged sediment samples the 1413 and 873  $\text{cm}^{-1}$  peaks are related to calcium carbonate and the 1007 and 778  $\text{cm}^{-1}$  peaks are associated with the Si-O bond, both present in dredged materials (Fig. 3). As was the case by the sand and kaolin spectra, the dredged sediment

spectra demonstrated no significant changes in peak position or intensity and are comparable to the spectrum of the water-treated sample.

The results demonstrate that dredged sediment, like other fillers tested in this research, does not chemically interact with sulfate salts. Therefore, although dredge sediment filler can prevent efflorescence, it does not accomplish this through chemical sorption of sulfate salts. It remains to be determined by what mechanism dredged sediment has the ability to prevent efflorescence.

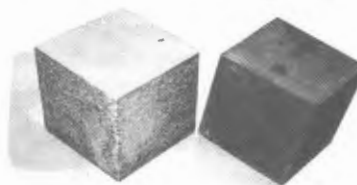


Figure 1. Samples from Columbia Test. The sample containing filler from sand exhibits efflorescence and degradation at the corners while the sample with treated dredged material filler does not (from left to right).

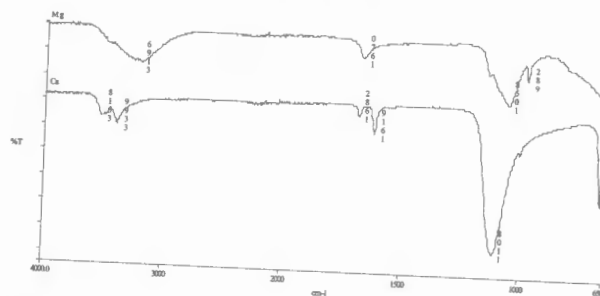


Figure 2. Spectra of calcium sulfate dihydrate and magnesium sulfate heptahydrate. Mg: magnesium sulfate heptahydrate; Ca: calcium sulfate dihydrate

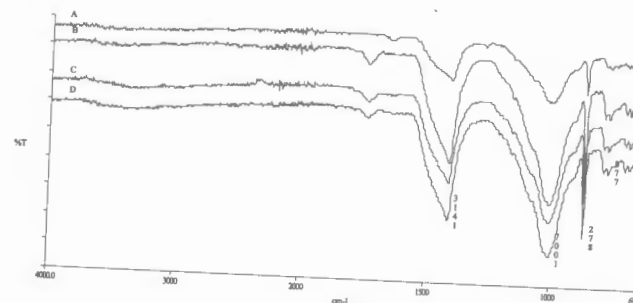


Figure 3. IR spectra of dredged sediment samples  
A. Treated with Solution 2 - 5 days  
B. Treated with Solution 2 - 12 day  
C. Treated with Solution 2 - 20 days  
D. Treated with Water - 20 days

## Elucidating the signaling pathways of the immune response in monocytes

By: Jennifer Deluty<sup>1</sup>, Jeremy Seto<sup>2</sup> and Stuart Sealfon<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup> Mount Sinai School of Medicine, NY, NY 10029

The innate immune response is initiated through diverse pathogen recognition receptors (PRRs) upon ligation with Pathogen Associated Molecular Patterns (PAMPs). These include membrane-bound receptors like the Toll-like receptors (TLRs), a group of highly conserved and widely studied membrane receptors, as well as the carbohydrate moiety detecting C-type Lectins. Cytoplasmic receptors including the RIG-like receptors (RLRs) and Nucleotide-binding Oligomerization Domain (NOD) receptors monitor the cytosolic compartment for foreign pathogens. PRRs recognize different components of microbes to generate a series of signals which lead to differential transcriptional activation and production of cytokines, including interferons that will direct the immune response.

These different molecular programs are identifiable as they elicit different cellular responses. The production of IL10, associated with a TH2 response, favors an overall anti-inflammatory response including humoral isotype switching in B cells and the production of mast cells and eosinophils, while production of IL12, IL 6 and Type I IFN often produce the TH1 response, activating macrophages, natural killer (NK) cells, and the secretion of immunoglobulins in a pro-inflammatory response(1).

Specifically, the experiments conducted focused on TLR2 and TLR4 activation and perturbation of the mitogen-activated protein kinase (MAPKs) and IKK shared by many PRRs. Three MAPKs, JNK, ERK, and p38, work in parallel to elicit a differential cellular response appropriate for the receptor pathway. It is known that the MAPK and IKK pathways contribute to differential IL12 and IL10 production in response to TLR2 and TLR4 activation. While IL12 and IL10 are produced in response to TLR activation, the balance towards IL12 favors TH1 while a balance towards IL10 favors TH2. Yet, the mechanisms and criteria for the particular bias in response is not clear. Literature suggests that TLR4 may work more through the p38 pathway and less through the ERK pathway to produce more IL12, while TLR2 signals through ERK to elicit more IL10(2).

Thus, we hypothesized that inhibiting the ERK pathway in the TLR2 model would decrease its TH2 cytokines and bias it toward a TH1 response while in the TLR4 model, inhibition of ERK would maintain its TH1 bias. Conversely, inhibition of p38 with TLR2 activation would maintain its TH2 bias, while inhibiting p38 in the TLR4 system would induce a TH2 like results.

These receptor pathways are also known to produce maturation markers such as CD 80 and CD 86, which are necessary for T cell interaction. The maturation markers help all antigen-presenting cells to connect with the MHC II complex of the T cell. We also hypothesize that inhibiting many of the IKK and MAPK pathways will have an

effect on the amount of maturation marker made and thus the effect the amount of interaction the DC will have with a T cell.

The monocytic line U937 is the primary functional model line for the behavior of dendritic cells because monocytes mature into different types of dendritic cells. Furthermore, an understanding of the pathway may enable a future knowledge of what contributes to the specificity of the differentiation to dendritic cells.

Manipulating and isolating each piece of this mechanistic circuit can help to elucidate the complete interactions of the systems. Greater knowledge of these signaling cascades will enable potential manipulations of the pathway for the treatment of many immune disorders. For example, TH1/TH2 biasing can help to treat diseases such as arthritis and asthma in which an improper TH1 response is seen.

The present data suggests that the IKK pathway is necessary for the production of CD80 and CD86 maturation markers. Inhibition of IKK leads to decreased expression of these markers and therefore decreased interactions with T cells in the immune response.

The cells treated with Pam3CSK4 (TLR2 agonist) show general decreases in their TH1 cytokines but general increases in their TH2 cytokines. If they were in fact ERK dependent as we hypothesized, then inhibiting ERK should have shown an increase in TH1 and a decrease in TH2. Thus this data is inconclusive in developing a true TH1/TH2 bias of TLR2 and TLR4. Results demonstrate the production of TH1 and TH2 cytokines by both pathways but don't necessarily support a biasing theory.

The data does demonstrate an effect of JNK on both TH1 and TH2 genes. JNK inhibition in both TLR4 and TLR2 stimulated cells results in dramatic decreases in cytokine gene expression. Thus, this demonstrates that the JNK pathway is necessary for this production.

Lastly, in much of the data, the IKK inhibition serves to increase the production of many cytokines. More experimentation must be conducted to further elucidate IKK effects on these responses. Yet, it is interesting that while IKK inhibition decreases the production of maturation markers, it enhances cytokine production.

With regard to the pathways' control on a TH1/TH2 response bias, results are inclusive. Some data such as increased ERK activation in Pam treated cells (figure 3) and gene expression of LPS treated cells (Figure 2) support the theory that TLR2 produce a TH2 response through more IL10 while TLR4 produce a TH1 response through more IL12. Yet, some data such as Pam3CSK4 gene expression proves opposite of this hypothesis (figure 2). Furthermore, it is unclear if these results in mice dendritic cells can be extrapolated to these human monocytes because of the differences in both cell type and species. More experimentation on effects of p38 inhibition, and replicates of the present data, as well as reproducing the data in dendritic cells must be performed.

## How the interplay between disorder and interaction affects static and dynamical properties of spin-1/2 Heisenberg systems

By: Freida Dukesz, Rebecca Segal and Lea F. Santos

Stern College for Women, Yeshiva University, New York, NY, 10016

The metal-insulator transition refers to changes in the transport properties of a given material. Good conductors are classified as metals, while insulators are associated with the suppression of conductivity. Several theoretical systems are used to model this transition. In our work, we considered a one-dimensional quantum many-body system described by the Heisenberg spin-1/2 model. It is well known that in the presence of on-site disorder, the states of the system with a single excitation become localized, that is, the system is an insulator. Contrary to that, delocalized states appear in metals. Much less is known when two or more interacting excitations are present. We studied how the interplay between interaction and on-site disorder affects the static and dynamical properties of the system. Our main finding is that interaction in disordered systems may enhance the spatial delocalization of stationary states and, as a result, an initial state with two excitations placed on separated sites spread in time super-diffusively.

The technical aspects of our work were divided between Dukesz and Segal. Dukesz was responsible for the computations on closed chains, while Segal focused on open chains. We wrote programs to measure the spreading of the system eigenstates over vectors of a given basis set; to measure the average distance between excitations; and to quantify the overall spread of the wavefunctions. The time evolution of these same quantities was studied for initial states with excitations placed on neighboring sites and also on separated sites.

## Glucagon-like peptide-1 receptor in human ovary

By: Esther Feder<sup>1</sup>, Rachel King<sup>1</sup>, Kate Rosenblatt<sup>1</sup>, Sarah Ezaoui<sup>1</sup>, Michael Goldman, M.D.<sup>2</sup>, Takako Araki, M.D.<sup>2</sup>, Miroslava Varadinova, M.D.<sup>2</sup>, Pauline Suwandhi, M.D.<sup>2</sup>, Yun Feng, M.D.<sup>2</sup>, Amit Seth, M.D.<sup>2</sup> and Donna Seto-Young, Ph.D.<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Department of Medicine, Division of Endocrinology and Metabolism, Beth Israel Medical Center, New York, NY 10003

The glucagon-like peptide-1 (GLP-1) receptor is found in the gastrointestinal gut and also widely distributed in various tissues. Exenatide is an incretin hormone, which is an analog of the GLP-1 receptor. GLP-1 is secreted by the endocrine cells in the epithelium of the small intestine, in response to glucose, stimulating the release of insulin.

We attempted to determine if the GLP-1 receptor is present in human ovary cells. Seto-Young and colleagues established that the human ovarian tissue culture contained granulosa, theca, and stromal cells. These cells were cultured in the presence or absence of insulin, with or without 25 or 50 pM exenatide. Cells were lysed and RNA was extracted using RNeasy RNA extraction kit (Qiagen). RT-PCR was performed using GeneAmp EZ RT-PCR kit (Applied Biosystems). Samples were preincubated at 62°C for 40 min, and then incubated for 45 cycles of 15 sec at 92°C and 40 sec at 62°C. Primers for GLP-1 receptor were designed for a 240 base pair product. Forward primer used was 5'- GTG TTC CCC TGC TGT TTG TT -3'. Reverse primer used was 5'- CTT GGC AAG TCT GCA TTT GA - 3'. cDNA was separated on 2.5% agarose gel and stained with ethidium bromide, then placed on a UV transilluminator. A single band was found at approximately 240 bp in the control sample. Cells stimulated with exenatide showed a band with increased intensity in a dose dependent fashion. Cells stimulated with insulin showed a band with increased intensity in a dose dependent fashion. However, the GLP-1 receptor mRNA expression is very low.

Steroid hormone concentrations in the tissue culture medium were measured using enzyme-linked immuno-sorbent assay (ELISA) (Alpco Diagnostics) or radioimmunoassay (RIA) (Diagnostic Systems Laboratories). Cells were cultured with appropriate steroid hormone substrates (30 µM pregnenolone, 15 µM DHEA, 3 µM testosterone or 3 µM androstenedione) in the presence or absence of insulin, with or without 25 or 50 pM exenatide. Exenatide stimulated progesterone by 18%. However, exenatide had no significant effect on testosterone or estrogen production.

The GLP-1 receptor is present in the human ovary, and is increased in dose dependent fashion by stimulation with exenatide, as well as stimulation with insulin. However, GLP-1 receptor expression is much lower than other steroidogenic enzymes such as steroidogenic acute regulatory protein (StAR) or 3-β-hydroxysteroid dehydrogenase (3-β-HSD). GLP-1 receptors are stimulated by exenatide and insulin. Exenatide stimulated progesterone production by 18% and had no significant effect on testosterone and estrogen production. The role of GLP-1 receptor in human ovary requires further investigation.



# U87 cancer cells respond to stable stimuli responsive antioxidant nanoprodrugs

By: Ilana Frankiel<sup>1</sup>, Bong-Seop Lee<sup>2</sup>, Aruna Nalla<sup>2</sup> and Talia Shear<sup>3</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup> Cedar Sinai Medical Center, Los Angeles, CA 90048; <sup>3</sup> Cornell University, Ithaca, NY 14850

Nanoprodrugs are nanoparticles containing NSAIDs (non-steroidal anti-inflammatory drugs), created to release drugs upon stimulation in the body. NSAIDs have been proven experimentally to inhibit angiogenesis and stimulate apoptosis within malignant tumors. COX-2 inhibiting NSAIDs in particular have shown promising results by inhibiting prostaglandin production, thereby preventing inflammation and tumor growth. However, NSAID selectivity, delivery and efficacy remain barriers in creating anticancer treatments.

Based on the enhanced permeability and retention effect (EPR effect), solid tumors should be targeted through their vasculature. Through fenestrations in vascular endothelial cells at tumor sites, macromolecules can easily enter tumor tissues and accumulate there for long periods of time due to poor lymphatic drainage. Anticancer drugs enveloped in nano-sized carriers can be targeted towards tumor endothelial cells and will then accumulate due to the EPR effect. Although our nanoprodrugs range in size between 100 and 200 nanometers, they fell within the ideal parameters for drug carrier size, allowing them to flow freely through the bloodstream and escape renal filtration.

The nanoparticle size and hydrophobicity allow the nanosphere to enter the targeted cells through endocytosis and enzymatically hydrolyze upon oxidation, releasing billions of drugs within the solid tumor. We created eight different nanoprodrugs, containing NSAID compounds (indomethacin, ibuprofen and naproxen) and structural compounds (ALA and TOCO), with varying sizes and components. In vitro U87 cancer cells cultures and HBVEC (human brain endothelial cells) cultures were prepared and treated with 100  $\mu$ M and 200  $\mu$ M nanoprodrugs. Cell counting showed the toxicity effects of the nanoprodrugs and allowed comparison between the healthy cells and the cancerous cells. Regarding the U87 cells, the results varied between the different nanoprodrugs. However, E9 and E3 showed true toxicity, with less than 20% cells alive at cell counting. The HBVEC were minimally affected by the nanoprodrugs, with an average of 70% still alive at counting. Two of the very effective nanoprodrugs, E9 and E10 were further tested on the U87 and HBVEC cells in varying concentrations, between 10  $\mu$ M and 100  $\mu$ M, in order to find the ideal concentration of toxicity to the tumor cells but not the healthy cells. 50  $\mu$ M proves to be the ideal concentration, killing 84% of the U87 cells and only 20% of the HBVECs. In addition to comparing the different NSAID sets, the cell counting data allowed comparison between the different configurations of one NSAID set. While more data must be collected to prove the true toxicity of E3, E9 and E10, the data collected shows success.

E3	Ibu-TEG-ALA/TOCO
E9	Ibu <sub>2</sub> -TEG/TOCO
E5	NPX-TEG-ALA/TOCO
E7	NPX <sub>2</sub> -TEG/TOCO
E6	IND-TEG-ALA/TOCO
E8	IND <sub>2</sub> -TEG/TOCO
E10	FA-TEG-ALA/TOCO
E11	FA <sub>2</sub> -TEG/TOCO

Figure 1. Nanoparticle label and corresponding chemical compound

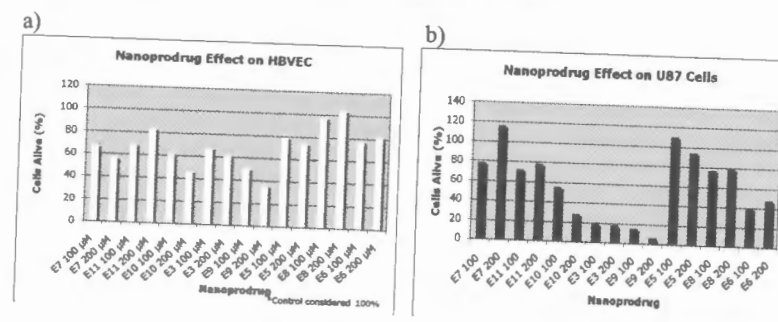


Figure 2. Percentage of cells alive after treated by nanoprodrug a) HBVEC b) U87 cells.

Additionally, nanoprodrug concentrations were measured weekly using HPLC (high-performance liquid chromatography), allowing estimation of the chemical stability of the nanoprodrugs. All nanoprodrugs stayed fully intact over the 8 week period, with only normal insignificant changes. The stability of our nanoprodrug was further shown through weekly size measurement of the nanoprodrug. Although minute changes did occur in nanoparticle size, either larger through combination or smaller through degradation, no compound changed more than 10 nm in the 8 week period. The in-vitro study of our eight nanoprodrugs reveals their stability over time, toxicity against U87 cells, and mild effect on human brain endothelial cells. In vivo testing in the future of our nanoprodrugs will be used to show their efficacy and response to body conditions

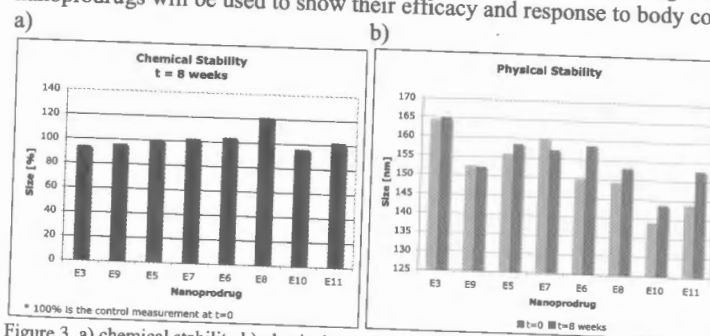


Figure 3. a) chemical stability b) physical stability of nanoprodrug at t = 8.

## The study of oxidized cholesterol in monolayer membranes: a cyclodextrin mediated desorption assay

By: Esther T. Frederick and Dr. Evan A. Mintzer

Stern College for Women, Yeshiva University, New York, NY 10016

Previous studies have shown that products of cholesterol oxidation change the behavior of cell membrane lipid bilayers. We attempted to quantify the interactions of cholesterol and its oxidized forms 5-cholesten-3 $\beta$ ,25-diol, also called 25-hydroxycholesterol (25-OH) and 5-cholestene-3 $\beta$ -ol-7-one, also known as 7-ketocholesterol (7-KC) with two typical membrane phospholipids, 1-palmitoyl-2-oleoyl-*sn*-glycero-3-phosphocholine (POPC) and Sphingomyelin (SPM). Pure monolayers of cholesterol, 7-KC and 25-OH were created on a Langmuir balance and then treated with cyclodextrin, a cyclic oligosaccharide with a hydrophobic cavity that extracts sterols from monolayers. Mixed monolayers of each sterol with POPC or with SPM were also prepared and treated with cyclodextrin in an attempt to obtain rates of desorption of each sterol from the respective monolayer. Due to experimental errors, reproducible data was unattainable; however, general trends in rates were noticeable. The data show different rates of desorption of the respective sterols from pure and mixed monolayers, which we postulate are due to differences in intermolecular interactions that are caused by the presence of an extra oxygen atom in the sterol. In pure monolayers, faster rates of desorption correspond to weaker interactions between molecules of pure sterol and stronger interactions of the sterol with cyclodextrin, with data showing that pure cholesterol desorbed slowest and 25-OH desorbed fastest. In mixed monolayers, faster rates of sterol desorption correspond to weaker intermolecular interactions between phospholipid and sterol. In mixed monolayers with SPM, general trends showed the rate desorption of cholesterol to be slowest, followed by 7-KC and swiftest desorption rate was obtained with 25-OH. In mixed monolayers with POPC, trends were the same with cholesterol being desorbed slowest, followed by 7-KC and 25-OH desorbed fastest. Since concrete data was unattainable, this study focuses on the difficulties faced when attempting to obtain quantitative data for intermolecular sterol: lipid interactions using a cyclodextrin assay and on the steps that can be taken to improve accuracy of the results.

## Molecular characterization of the calcium efflux transporter protein in *Streptococcus pneumoniae*, CaxP

By: Tamara Freiden<sup>1</sup>, Jason Rosch<sup>2</sup> and Elaine Tuomanen<sup>2</sup>

<sup>1</sup>Stern College for Women, New York City, NY 10016; <sup>2</sup> St. Jude Children's Research Hospital, Memphis, TN 38105

*Streptococcus pneumoniae* is estimated to be responsible for 15 cases of invasive pneumococcal disease per 100,000 persons a year in the world, especially affecting the young, elderly, and those with underlying immunodeficient medical conditions like sickle cell and HIV. This pathogen causes one million deaths per year as well, and is the leading cause of pneumonia, the illness responsible for more deaths in children than any other disease. The mechanisms to control *S. pneumoniae* and the diseases it causes have busied researchers as far back as the knowledge of its pathogenesis. However, bacterial strains are increasingly becoming more resistant to antibiotics. The current vaccines, the 23-valent polysaccharide vaccine and the 7-valent conjugate vaccine for children, target the polysaccharide capsule by preventing host-mediated phagocytosis. However, like resistance to antibiotics, they encounter problems with prevention as well. The wide variation of polysaccharide serotypes, the hazard of polysaccharide serotypes not protected against in the vaccines, the complexity of production, and the expense and inadequacy of the vaccine especially in third world countries all contribute to the necessity for alternative vaccines which do not depend on the polysaccharide capsule.

Recently, a calcium exporter protein in pneumococcus, known as CaxP, has been classified by extensive sequence similarity to the SERCA calcium exporter found in the sarcoplasmic reticulum of eukaryotes. Though the mechanisms of bacteria to prevent a harmful accumulation of trace ions are much less explored, they are just as crucial to its growth. In the specific case of *S. pneumoniae*, the lungs and blood have a concentration of calcium 1000 times greater than that which is maintained in the bacteria. Cation sensitivity to both calcium and manganese (as a secondary transporter) in this protein were verified by comparing the zone of inhibitions when grown with filter disks inoculated with the respective metal. Essentially, without CaxP, the high calcium concentration in the human host would be extremely toxic. In order to maintain homeostasis, CaxP is critical to *S. pneumoniae*, and therefore plays a significant role in its pathogenesis. In fact, the knockout strain was shown to be completely attenuated in the host. This has numerous, useful ramifications. Mainly, as the resistance to multiple antibiotics continues to increase, CaxP presents a viable antibiotic and potential vaccine.

The goal of this study was to map the active site of the CaxP transporter by characterizing the specific amino acids responsible in calcium and manganese efflux. Site-directed mutagenesis was utilized by comparing it with the eukaryotic yeast secretory pathway of Ca<sup>2+</sup> and Mn<sup>2+</sup>. Once the residues required for cation specificity of these channels were identified, the target is further defined.

Name	Amino Acid Number	Original	Replacement
V305A	305	Valine	Alanine
A306G	306	Alanine	Glycine
I308A	308	Isoleucine	Alanine
E310A	310	Glutamic Acid	Alanine
N709S	709	Asparagine	Serine
N709A	709	Asparagine	Alanine
E712A	712	Glutamic Acid	Alanine
N736A	736	Asparagine	Alanine
T739M	739	Threonine	Methionine
T739A	739	Threonine	Alanine
D740A	740	Aspartic Acid	Alanine
Q824A	824	Glutamic Acid	Alanine
Q824D	824	Glutamine	Aspartic Acid

Figure 1. Potential important point mutations in the active site of the CaxP Protein. Those highlighted in white were successfully constructed.

Three mutants of the thirteen potential point mutations were successfully constructed and two were further tested for their role in CaxP's active site during the time span of research. Of those constructed and analyzed, V305A was found to have no relevance on the active site with an average zone of inhibition of 0 cm for calcium and 0.25 cm for manganese. As compared to the CaxP control which had 0 cm for calcium and 0.1 cm for manganese, there was no significant difference at this mutation. However, the mutant D740A did seem to have an effect with an average zone of inhibition for calcium of 0.7 cm and 1.2 cm for manganese. Although this is a sampling of only two amino acid variations, there are both similar and unrelated points to the active site of calcium efflux transporters in eukaryotes, stressing the necessity to continue constructing and testing the rest of the mutants.

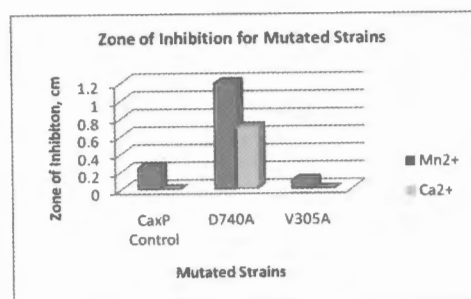


Figure 2. Measured zone of inhibition for the two constructed mutant strains. While V305A remains similar to the CaxP control, D740A has a zone of inhibition of 1.2 cm for Mn<sup>2+</sup> and 0.7 cm for Ca<sup>2+</sup>.

## Comorbid suicidality and alcohol abuse in adolescents: Etiologic factors

By: D. Ganz and T. DiLorenzo.

Stern College for Women, Yeshiva University, New York, NY 10016

Alcohol abuse and suicidality independently threaten adolescent populations throughout the world. Consistent positive correlations have been found between adolescent drinking and suicidal ideation and behaviors, and longitudinal studies have found that adolescent drinking is related to increases in suicidality. It is theorized that while alcohol use in general may have a distal interaction with suicidality through gradual cognitive and psychosocial degeneration, binge drinking is implicated as a more proximal precipitating factor of suicide attempts. Alcohol abuse and suicidal behavior in adolescents have been found to have biochemical and genetic correlates, with hypothalamic-pituitary-adrenal (HPA) system abnormalities being associated with both conditions. Individuals with alcoholism and suicidality often present with aggression, impulsivity, other psychiatric conditions and less developed coping mechanisms. Alcohol use and suicidality, alone or in association, may be a consequence of childhood abuse, social pressures, low self-esteem and/or delinquency- all of which may be particularly salient among adolescent populations. Some studies implicate such adolescent stressors in the self-medication model, such that alcohol is consumed to medicate depressive or suicidal feelings. Additionally, the social stigma associated with alcoholism and suicidality may prevent adolescents from seeking information about or treatment for such psychological conditions. Identification of factors related to alcohol abuse and suicidality can inform clinical and educational interventions aimed at preventing or treating problem behaviors in adolescents, as well as policy decisions regarding this population.

## Behavior of two oxidized cholesterol species in a model membrane system

By: Sharon Gordon and Evan A. Mintzer, Ph.D.

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

Cholesterol is known to play an integral role in eukaryotic cell membrane function and structure. Oxidized cholesterol species (oxysterols) are formed either by enzyme catalysis or auto-oxidation and are known to be cytotoxic. The objective of this study was to investigate the interactions of two oxysterols, 7-ketocholesterol and 25-hydroxycholesterol, with brain-derived sphingomyelin in a model membrane system. A detergent solubility assay was utilized to qualitatively determine the extent of formation of detergent-resistant domains in multi-lamellar vesicles in which cholesterol was replaced by oxysterols. The vesicles were treated with the detergent Triton X-100 to observe the extent of membrane raft development through the analysis of spectrophotometric data. The preliminary results suggest that lipid raft formation is sensitive to the specific oxysterols used and their relative amounts. Based on these data, it is proposed that oxidized cholesterol species alter sterol-sphingomyelin interactions, affecting membrane raft formation.

## Differential EGFR/HER-2 signal transduction pathway protein phosphorylation in breast cancer

By: Orli Haken<sup>1</sup>, Stefani Thomas<sup>2</sup>, Zhongping Liao<sup>2</sup>, Yunhu Wan<sup>2</sup> and Austin Yang<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, Manhattan, NY 10016; <sup>2</sup>Molecular and Structural Biology Program, Greenebaum Cancer Center, University of Maryland School of Medicine, Baltimore, MD 21201

Breast cancer is the second-most common lethal cancer in women. 30% of all cases are characterized by the overexpression of the Human Epidermal Growth Factor Receptor 2 (HER-2). Upon ligand binding, HER-2 forms a heterodimer with Epidermal Growth Factor Receptor (EGFR) on the cell surface, which then potentiates an intracellular signal transduction pathway that causes the phosphorylation of downstream proteins and the transcription of oncogenic genes. In order to more thoroughly understand the molecular mechanism of the EGFR/HER-2 pathway, an analytical approach such as proteomics is needed in order to comprehensively analyze all the proteins in the signaling cascade. Proteomics is the large scale study of proteins, specifically their structures and functions.

The goal of this study was to perform a proteomic analysis of breast cancer cells to study global phosphorylation dynamics, and specifically the signal transduction pathway of EGFR/HER-2. The experiment was conducted using SKBR3 cells, a breast cancer tumor cell line overexpressing endogenous HER-2. The workflow included lysis of the cells to produce soluble protein fractions, which were then reduced, alkylated, and digested with trypsin. The resulting peptide mixture was then desalted using C18 chromatography, enriched for phosphopeptides using titanium dioxide, and desalted again prior to Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS) analysis. All peptide fractionation and enrichment steps prior to LC-MS/MS were performed using Stop and Go Extraction (Stage) Tips, an economical method for chromatographic separation without the use of an HPLC system. A human protein database search was run for protein identification.

The efficiency of our phosphopeptide enrichment method was ~78%. 801 phosphoproteins and 1004 phosphopeptides were identified from 500 µg of protein from soluble cell lysate. Figure 1 is an MS/MS spectrum along with the ion coverage of a confidently identified phosphopeptide from the protein sample. This method had a broad dynamic range and allowed the identification of many different classes of phosphoproteins including signaling, receptor, cytoskeletal, and cell adhesion proteins, in addition to kinases and other enzymes.

Future studies include a temporal and quantitative phosphoproteomic analysis of the EGFR/HER-2 signal transduction pathway in SKBR3 cells. The long-term goal of this project is the elucidation of the EGFR/HER-2 signal transduction pathway in breast cancer.

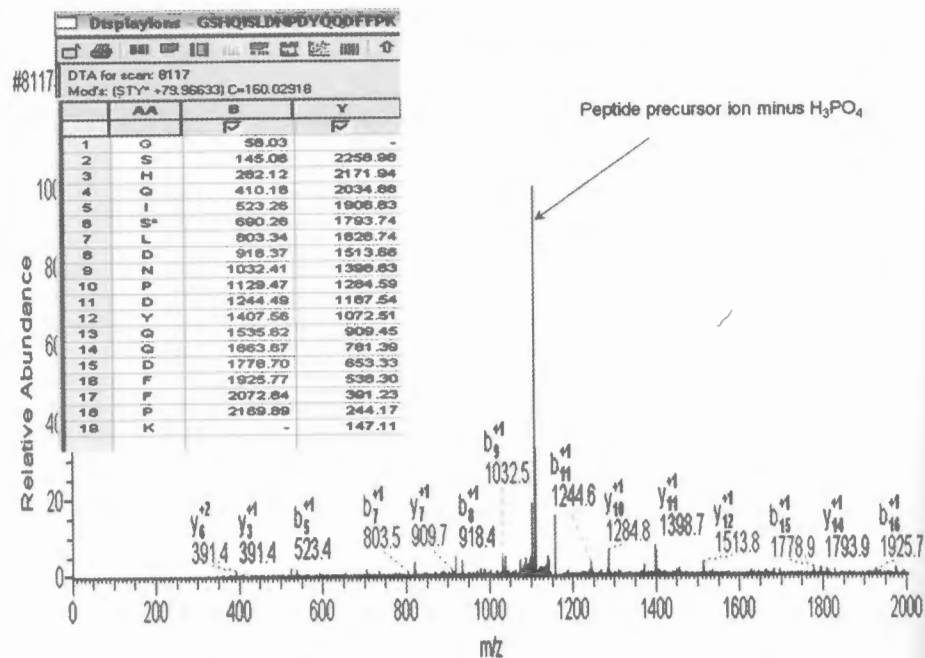


Figure 1: Confidently identified Epidermal Growth Factor Receptor (EGFR) phosphopeptide.

## Anticarcinogenic and pro-apoptotic properties of olive extract

By: Orli Haken, Aimee Krausz and A.G. Schuck

Department of Biology, Stern College for Women, New York, NY 10016

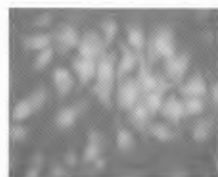
Olives (*Olea europaea*), a significant part of the Mediterranean diet, is one of many natural food products that provides an array of pharmacological health benefits. Like other natural consumed products, which include black and green teas, pomegranates, *Ginkgo biloba*, and red wine, olives contain non-nutritive constituents, termed nutraceuticals, which provide protection against conditions such as cardiovascular disease, mental decline due to aging, and tumorigenesis. Polyphenols, one class of nutraceuticals, have known antioxidative and anticarcinogenic properties. Several polyphenolic compounds, such as those found in green and black teas, have been shown to display prooxidative, in addition to their antioxidative, properties. The most abundant polyphenols in olives, and those to which the antioxidant and anti-inflammatory activities are attributed, are verbascoside and hydroxytyrosol. While the anticarcinogenic properties of olive extract have been established, the cellular mechanism of cytotoxicity toward cancer cells has not.

This research studied the cytotoxic effects of olive extract toward normal fibroblasts (HF-1) and squamous carcinoma (HSC-2) cells derived from the human oral cavity. Using the neutral red (NR) cell viability assay, we demonstrated that HSC-2 cells exhibited greater sensitivity to the olive extract than the HF-1 cells. The attenuation of toxicity of olive extract in the presence of divalent cobalt (Co<sup>2+</sup>), a general scavenger of reactive oxygen species (ROS), suggested that the cytotoxic activity of the extracts could be due in part to the induction of oxidative stress within the carcinoma cells. Fluorescent microscopy of acridine orange-stained cells revealed the maintenance of normal cell morphology of HSC-2 cells treated with olive extract in the presence of Co<sup>2+</sup>, in contrast to cells treated with olive extract alone, which displayed morphological changes typical of cell death (Figure 1).

Oxidative stress is one of the initiators of apoptotic cell death. The apoptotic-inducing activity of olive extract toward HF-1 and HSC-2 cells was studied using fluorescence microscopy and western blot analysis. HSC-2 cells treated with olive extract displayed some of the characteristic morphological changes of apoptotic cells (namely, hypercondensed nuclei; Figure 1b). Western blotting to detect the expression of apoptosis-induced proteins has thus far been inconclusive.

These studies suggest that the anticarcinogenic effects of olive extract polyphenols may be due in part to their ability to induce oxidative stress, and thereby apoptosis, of cancer cells.





(a)



(b)



(c)

Figure 1. HSC-2 carcinoma cells: (a) untreated, (b) treated with 200 µg/mL olive extract, and (c) treated with 200 µg/mL olive extract in the presence of 250 µM  $\text{Co}^{2+}$ . Magnification 320X, acridine orange stain.

## Prolonged/imaginal exposure in PTSD: A literature review

By: R. Hazan and T. DiLorenzo

Stern College for Women, Yeshiva University, New York, NY 10016

This paper is a literature review of Imaginal Exposure (IE), a major component of Prolonged Exposure (PE), which has become one of the most empirically supported forms of treatment for PTSD. PE is a cognitive-behavioral therapy that is composed of both imaginal and in vivo elements designed to help the client dissociate his/her previous trauma from current experiences and thereby reduce PTSD symptoms. During IE, the therapist assists the client in reliving the most distressing traumatic experience(s) in complete detail, either directly or with the facilitation of visual or audio aids. This helps the client integrate his or her memory of the trauma and realize that it was a past experience that does not interfere with the present. Imaginal exposure is introduced in session 3 (out of 10 90-minute sessions) of the standard course of PE treatment. Modifications are sometimes implemented when addressing special populations, such as those who overengage or underengage during exposure, or those who may experience minor symptom exacerbation. Although PE has gained empirical support as an effective treatment, its practical considerations and limitations prevent it from becoming widely accepted among practitioners. For example, one of the greatest barriers is a strong misconception among practitioners that IE promotes severe symptom exacerbation and consequent dropout. Both PE and IE offer many opportunities for expansion, such as augmentation with other treatment methods, and integration into treatment for other psychiatric disorders.

## Spectral modification to genetically encoded single-chain RhoA biosensor

By: Tsipora Huisman<sup>1</sup> and Louis Hodgson<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Gruss-Lipper Biophotonics Center, Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY 10461

Rho family of p21 small GTPase is a class of regulatory proteins that controls numerous biochemical processes in a cell, including adhesion, contraction, and cell motility. Within this subfamily RhoA specifically mediates actin cytoskeleton dynamics and myosin-mediated contraction. Recent findings indicate involvement of Rho GTPases during protrusion of the leading edge lamellipodium. However, it is not yet clear which pathways are being regulated at the leading edge and how such pathways intersect among different signaling cascades initiated by other family members of Rho GTPases, including Rac1 and Cdc42.

A major issue in this area of study is that the signaling cascade involving RhoA, Rac1 and Cdc42 are interdependent and occur simultaneously at rapid rates, thereby precluding most conventional assay approaches. Therefore, to determine the kinetic relationship of the different Rho GTPases, it would be necessary to observe two or more different GTPase activities at the same time in a single living cell. Using the red-shifted fluorescent proteins (monomeric Cherry, monomeric tagRFP, monomeric Kusabira orange fluorescent protein) was necessary to shift the spectral requirement of RhoA to the red and far-red domain so as to make RhoA biosensor compatible with other sensors that require cyan and yellow colors to report their activities.

We used recombinant DNA technology to change the fluorescent proteins to red-shifted versions in the RhoA sensor. The intrachain linker lengths needed to be optimized to account for slight differences in molecular size and orientations of the new fluorescent proteins. We validated and characterized the new biosensors *in vitro* using spectrofluorometry in living HEK293T cell line. Based on our data we produced a significant improvement, up to 40% change in FRET ratio in biosensor response comparing all on versus all off conditions, using different linker lengths as well as different fluorescent protein pairs.

## Centriole elongation and centriole length control in spermatocytes of *Drosophila* stage arrest mutants *aly*<sup>1</sup> and *can*<sup>1</sup>

By: Hadassa Klerman<sup>1</sup>, Frederick Chim<sup>2</sup> and Tomer Avidor-Reiss<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Department of Cell Biology, Harvard Medical School, Boston, MA 02115

Little is known about centriole length control mechanisms. In *Drosophila melanogaster*, the centriole, a hollow cylindrical organelle rich in microtubules, elongates throughout spermatogenesis. The small variability of centriole length at any given spermatogenesis stage suggests the presence of some length regulatory mechanism. The relationship between centriole elongation and spermatogenesis differentiation was tested by quantifying centriole elongation in spermatogenesis stage arrest mutants always early (*aly*) and cannonball (*can*). These mutants arrest or terminate cell differentiation at the spermatocyte stage S6 of spermatogenesis, preventing development of mature, motile sperm. Testes of homozygous *aly*<sup>1</sup> and *can*<sup>1</sup> flies with centriolar marker Ana1-GFP were dissected and imaged. The high maturity of S6 cells in the arrested mutants contributed to the higher average centriole length in the mutants when compared to the control. However, the precisely controlled length in the mutants and the arrested mutants' significantly lower variance indicate that no further elongation beyond normal S6 centriole length took place. We concluded that (i) centriole length control mechanism is independent of genes required for spermatocyte differentiation, and (ii) initiation of centriole elongation beyond S6 depends on the cell differentiation program. Further research is needed to identify the control mechanism for centriole length in general and to elucidate the relationship between cell differentiation and initiation of centriole elongation in cells beyond S6.

## Autophagy involvement in primary cilia growth in mouse fibroblasts

By: Jennifer Kraut<sup>1</sup>, Birgit Satir<sup>2</sup>, Peter Satir<sup>2</sup> Ana Maria Cuervo<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Albert Einstein College of Medicine, Yeshiva University, Bronx, NY 10461

Primary cilia are sensory organelles that display specific receptors and ion channels, which transmit signals from the extracellular environment via the cilium to the cell to control tissue homeostasis and function. These protrusions are formed in nearly all growth-arrested and differentiated cell types in vertebrates. Failure of an organism to form primary cilia may have devastating effects including certain human pathologies such as polycystic kidney disease and Bardet-Biedl syndrome.

Previous studies have shown that primary cilia formation is induced during starvation. Nutrient deprivation also activates the process of autophagy in cells. Autophagy is an intracellular process that results in the degradation of cytosolic components inside lysosomes in order to provide cells with nutrients during starvation. The fact that autophagy and primary cilia formation are occurring in the cell at the same time lead us to hypothesize that cellular components degraded through autophagy may be used as the building blocks for primary cilia formation.

To test this hypothesis, NIH3T3 cells, a type of mouse fibroblast, were grown in 10 cm plates at 37°C until they reached confluence. They were then seeded to 12-well plates and some of the cells were grown in nutrient-rich medium while others were grown in nutrient-deficient media for a period of 24 hrs. At the end of this time period, the cells were fixed with methanol and immunostained with antibodies against  $\alpha$ -acetylated tubulin and  $\gamma$ -tubulin in order to view their primary cilia and centrioles respectively under an immunofluorescence microscope. This same procedure was done for two additional NIH3T3 cell lines knocked-down for LAMP-2A or Atg7. Each of these cell lines is impaired for one type of autophagy, with the LAMP-2A (-) cells having a 95% reduction in chaperone-mediated autophagy (CMA) and the Atg7 (-) cells having an 80% reduction in macroautophagy.

It was expected that the mutant cells would not form primary cilia upon starvation if any of these types of autophagy is indeed required for their formation. However, we found that upon 24hr starvation both the control cells as well as the mutant cells are capable of forming primary cilia, allowing us to conclude that autophagy is not required for cilia formation. Interestingly, analysis of the length of the cilia in the control and the two mutant cell lines revealed that Atg7 (-) cells are capable of forming longer primary cilia (4-5  $\mu$ m) compared to control cells, whereas cilia in the LAMP-2A (-) cell line are shorter than in control cells. In addition, this last cell line displays long microtubule protrusions upon serum removal that do not appear in the control or in Atg7 (-) cells.

Based on these results, we conclude that primary cilia formation occurs independently of autophagy, however cilia elongation may require active CMA as cells with compromised CMA have shorter ciliary length. Future studies are needed to determine whether the cilia in each of the cell lines contain the same building blocks, such as PDGFR- $\alpha$ , which has shown to co-localize with the  $\alpha$ -acetylated tubulin in the primary cilia in previous studies. Staining of primary cilia with those two antibodies in the cell lines deficient for macroautophagy or CMA will help us in identifying possible differences in cilia composition as result of changes in autophagy.

## Gap junction remodeling and post-translational phosphorylation of connexin 43

By: Danielle S. Lent<sup>1</sup>, Benjamin F. Remo, M.D.<sup>2</sup> and Glenn. I. Fishman, M.D.<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Leon H. Charney Division of Cardiology, New York University School of Medicine, 522 First Ave, Smilow 801, New York, NY 10016, USA.

Intercellular channels, known as gap junctions, connect adjacent myocardial cells at discrete areas of the plasma membrane and coordinate cell-to-cell communication. Many cardiac arrhythmias, including ventricular tachyarrhythmias that may lead to death, are thought to occur in part due to gap junction remodeling (GJR). GJR is the abnormal expression and function of gap junction proteins that occurs in response to various myopathic stimuli, such as high pressure and ischemia. Connexin 43 (Cx43) is the main cardiac gap junction protein. The abnormal expression and function of Cx43 increases susceptibility to spontaneous tachyarrhythmias (Gutstein et al. 2001). The inhibition of casein kinase-1 $\delta$  (CK1 $\delta$ ), which phosphorylates Cx43 at Serines 325, 328 and 330, results in the mislocalization of Cx43 to the non-gap junctional plasma membrane (Cooper and Lampe 2002).

The goal of this research was to establish that CK1 $\delta$ -dependent phosphorylation of Serines 325, 328 and 330 of Cx43 is necessary for normal transport and localization of Cx43 to the gap junctions. We hypothesized that the loss of this phosphorylation should play an important role in gap junction remodeling.

Two types of genetically engineered mice were prepared: S3E Knock-in mice have Serines 325, 328 and 330 substituted with negatively-charged glutamic acids to mimic permanent phosphorylation; S3A Knock-in mice have Serines 325, 328 and 330 substituted with uncharged alanines to create non-phosphorylatable sites. These mice were compared at baseline and in response to myopathic stimuli such as the Langendorff Global Ischemia Model and Transverse Aortic Constriction (TAC). Immunofluorescence of wild-type (WT) and mutant hearts was performed at baseline and after myopathic stimuli to determine any differences in the amount of Cx43 at the gap junctions. At baseline, the S3A mice exhibited less Cx43 than both the WT and S3E mice. After 30 minutes of Global Ischemia there was a decrease in the amount of Cx43 in all three genotypes relative to baseline, with the S3A mice exhibiting the least amount of Cx43. Similarly, after 2 weeks of TAC, the S3A mice exhibited the least amount of Cx43.

These preliminary results offer some insight into the role of CK1 $\delta$ -dependent phosphorylation in the normal transport and localization of Cx43. Further experiments will be needed to determine the functional ramifications of this mechanism.

## Tunneling transport in devices with semiconducting leads

By: Amy LeVee and Emil Prodan

Stern College for Women, Yeshiva University, New York, NY, 10016

Molecular electronics is a new, emerging branch of Condensed Matter Physics, where research is conducted with the goal of designing electronic circuits out of molecules. In our research we extend the modern theory of tunneling transport to finite temperatures enabling applications to molecular electronic devices connected to semiconducting leads such as those made of alkyl chains connected to silicon nano-wires shown below.

For these devices we mapped the transport characteristics as functions of temperature and alkyl chain's length. We found a good qualitative agreement between our theoretically calculated I-V characteristics (see the figure on the left) and the experimental measurements.

Furthermore, we discovered that based on the computer calculations and on the analytic theory the tunneling decay constant is determined not by the Fermi level, as it is in the case when the molecules are attached to metallic leads, but by the edge of the valence or conductance band of the semiconducting leads, whichever is closer to the Fermi level. We gained further insight by mapping the evanescent transport channels of the alkyl chains (see the blue region in the figure below) and few other physical quantities appearing in the analytic formula for conductance. For example, the iso-surface plots in the figures below reveal a strong overlap between these evanescent conducting channels and the potential perturbation of the leads (left) and the local density of states of the device (right), this fact explains why the top valence states give a very large contribution to the conductance, while contributing very little to the density of states.

### References:

Emil Prodan and Amy LeVee, Tunneling transport in devices with semiconducting leads, under review by Phys. Rev. B (see also [arXiv:0907.4636](https://arxiv.org/abs/0907.4636))

## Interactions between microtubules and kinesin-13

By: Emily Liebling<sup>1</sup>, Ana B. Asenjo<sup>2</sup>, Vania De Paoli<sup>2</sup>, Uttama Rath<sup>2</sup>, David Sharp<sup>2</sup> and Hernando Sosa<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Department of Physiology and Biophysics, Albert Einstein College of Medicine, Bronx, NY 10461

Kinesin, a superfamily of molecular “motors”, uses ATP (adenosine triphosphate) to propel itself along microtubules. Kinesin-13’s behave differently than other kinesin families, such as kinesin-1, and do not undergo unidirectional movement. Instead, they diffuse to the ends of the microtubules where they induce depolymerization. Microtubule depolymerization is an essential component of chromosomal segregation during mitosis. Kinesins are made up of three main components: a motor domain, neck, and coiled coil. The motor domain, which serves as the location for microtubule and ATP binding, is the minimal domain necessary for the depolymerization activity of kinesin-13’s.

The mechanism by which kinesin-13’s depolymerize microtubules is believed to involve the curving of tubulin protofilaments at the microtubule ends. We examined the interactions between kinesin-13 and microtubules in the ATP hydrolytic cycle using various nucleotide conditions. Previous research has shown that conditions of high affinity of kinesins for microtubules produce a regular protein-microtubule decoration pattern. Electron microscopy, from ongoing studies in this lab, revealed that in the presence of AMP-PNP (adenosine-5\_-([\_])-imido)triphosphate, a non-hydrolyzable ATP analogue, some kinesin-13’s form oligomeric rings and spirals around microtubules. We are currently exploring KLP59D, which does not form rings during depolymerization. Surprisingly, we have found that this kinesin-13 removes tubulin from the interior microtubule lattice, a phenomenon not previously noted. In addition to initiating depolymerization at the ends, KLP59D cuts microtubules in the middle. These experiments are the first to demonstrate such findings, shedding light on the mechanism of kinesin-13 activity.

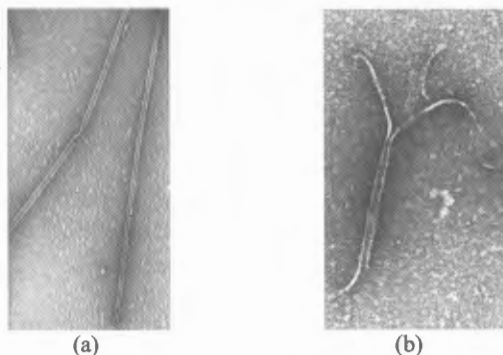


Figure 1. *D. melanogaster* kinesin13 KLP59D FL (a) Severing of microtubules in the presence of ATP (b) Depolymerization in ATP.

## Development of an improved estimate of PTSD prevalence among OEF/OIF veterans treated at Veterans Affairs facilities

By: Rena Miller<sup>1</sup>, Matthew J. Reinhard, Psy.D.<sup>2</sup>, and Kelly McCoy Psy.D.<sup>2</sup>, Laura Hightower<sup>2</sup>, Peter Amann<sup>2</sup>, Remy Ball<sup>2</sup> and Han K. Kang, Dr. P.H.<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup> War-Related Illness and Injury Study Center, Washington, Veteran Affairs Medical Center, Washington, DC 20422

The ICD-9 posttraumatic stress disorder (PTSD) diagnosis (i.e. 309.81) was held by 92,998 of the separated Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) veterans who came to the Veterans Affairs (VA) Medical Center as of September 2008. There is variability in how clinicians assign this diagnosis and how it is maintained or discontinued within veterans’ medical records. For instance, it is likely that there are veterans diagnosed with PTSD at one point in time that will no longer meet criteria for this disorder at a later point due to treatment effects or refined differential diagnosis, yet their medical records may or may not reflect these changes.

This summer we started a study to improve the way PTSD prevalence among OEF/OIF veterans in the VA medical system is estimated. First we developed prediction models to estimate the number of OEF/OIF veterans who suffer from PTSD. The prediction models are derived from variables available in the national administrative database that are deemed important according to clinical considerations. Presently, we are thoroughly reviewing the medical records of 1000 veterans who were selected through stratified random sampling from the 92,998 OEF/OIF veterans that carry an ICD-9 diagnosis of PTSD. The sample equally represents the percent of the 92,998 veterans from each region of the country. We are currently coding the 1000 veterans’ medical records for many variables in order to decide on “confirmed PTSD” or “non-confirmed PTSD” for each veteran. After we finish this task, we will apply the prediction models to the sample 1000 veterans’ records and find which model’s assessment matches our findings of “confirmed” and “non-confirmed” PTSD. Finally, we will apply the prediction model that is most consistent with our manual review of the record to the whole population of the VA administrative database in order to establish a more precise estimate of the number of veterans with PTSD who utilize the VA health services.



# Potential chemopreventive properties of a pomegranate juice extract

By: Chana G. Ovits-Levy, Lorie J. Solodokin, A.G. Schuck, and H. Babich

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

There is a large body of literature linking consumption of plant-based foods to a substantial reduction in the risk of developing various cancers. Chemoprevention is related to the consumption of high levels of non-nutritive phytochemicals, termed nutraceuticals, contained within these foods. Polyphenols, a category of nutraceutical, are interesting since although mainly identified as antioxidants, there is increasing literature noting their prooxidant properties. Prior studies in our laboratory have shown that extracts from green tea, black tea, and *Ginkgo biloba* exhibited prooxidant activity, causing oxidative stress and apoptotic cell death instead of cancer, as opposed to normal cells derived from tissues of the human oral cavity. Cancer is a complex pathology and both the antioxidant and prooxidant properties of phytochemical polyphenols are thought to play a role in chemoprevention. The direction of our research now focused on a polyphenol-rich extract from pomegranate juice. Our initial intent was to quantify the generation of reactive oxygen species (ROS) from the extract and thereafter to discern whether the generation of ROS was substantial enough to exert cytotoxic effects through the induction of oxidative stress. The research employed normal HF-1 gingival fibroblasts and carcinoma SCC1483 and CAL27 cells derived from tissues of the human oral cavity.

Our studies showed that the pomegranate juice extract (PJE) exhibited prooxidant activity, in a time- and concentration-dependent manner (Figure 1).

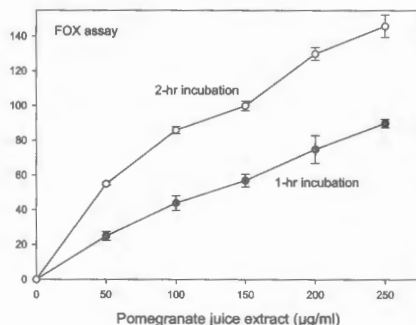


Figure 1: Generation of hydrogen peroxide, as determined by the ferrous ion oxidation xylenol orange (FOX) assay, in cell culture medium amended with varying concentrations of PJE. The data are expressed as the arithmetic mean  $\pm$  S.E.M.

A 24-hr exposure to various concentrations of PJE showed that toxicity, as determined with the neutral red assay, was greater towards cells derived from cancerous tissue (i.e., the SCC1483 and CAL27 carcinoma cells) than towards normal fibroblasts. Divalent cobalt ( $\text{Co}^{2+}$ ), a scavenger of ROS, promotes the degradation of hydrogen peroxide to water and molecular oxygen. The cytotoxicity of PJE was lessened in the presence of  $\text{Co}^{2+}$  (Figure 2), suggesting that the induction of oxidative stress was a component of the overall cytotoxic effects of PJE.

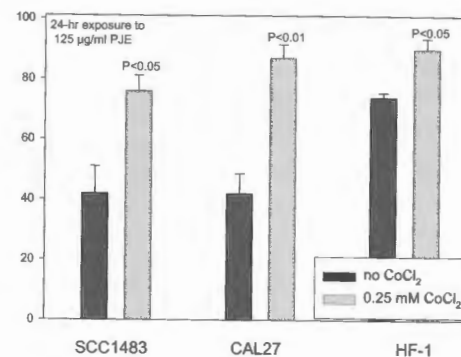


Figure 2: Lessening of the cytotoxicity of 125 µg/ml PJE in the presence of divalent cobalt. The data are expressed as the arithmetic mean percent of control  $\pm$  S.E.M.

The mode of cytotoxic death apparently was by apoptosis, as evidenced by morphological abnormalities, such as blebbing and hypercondensed nuclei, noted in the PJE-treated cells (Figure 3).

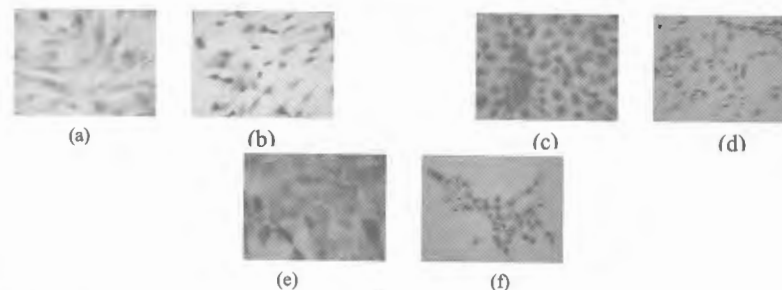


Figure 3: HF-1 fibroblasts (a) control (b) 225 µg/ml PJE; CAL27 carcinoma cells (c) control (d) 200 µg/ml PJE/ml; SCC1483 carcinoma cells (e) control (f) 200 µg/ml PJE; 320 X; aceto-orcein stain.

Research by DiSilvestro *et al.* (2009, *Phytother. Res.* 23:1123-1127) showed that mouth rinsing with a pomegranate extract reduced the risk of gingivitis. That study, coupled with the research herein showing the hypersensitivity of oral cancer cells to PJE, suggest the possibility of using pomegranate extract in oral health products, such as toothpaste and mouthwashes.

## Constructing red TRAF6 using standard molecular cloning techniques

By: Malka Perelman<sup>1</sup>, An-Jey Su<sup>2</sup>, Kent Wang<sup>2</sup> and Philip Auron<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016 <sup>2</sup>Department of Biological Sciences, Duquesne University

The immune and skeletal systems share many molecules in their signaling repertoire. Particularly, TNF receptor-associated factor 6 (TRAF6) plays an important role in osteoclast differentiation, initiated through its interaction with the cytoplasmic domain of RANK receptor in a process that requires the downstream activation of Tec family kinases. Knockout of either RANK, TRAF6, or Tec results in osteopetrosis and anemia. In order to visualize the interaction among these three molecules, standard molecular cloning techniques were used to construct an expression vector coding for a TRAF6 engineered to generate a red fluorescent color within living cells. When co-transfected along with a vector coding for green fluorescent Tec kinase, it is then possible to observe the relative localization of these two tagged molecules following cell treatment with RANK ligand. This addresses the question of whether these two critical molecules associate as part of the osteoclast activation process.

In order to study the possible interaction between Btk and TRAF6, it was necessary to construct a red fluorescent TRAF6. When co-transfected along with the vector coding for green fluorescent Btk, the relative localization of the two can be visualized.

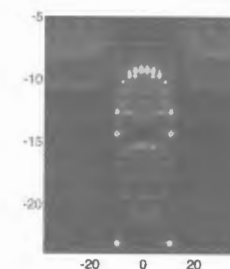
TRAF6 is inserted into the EcoRI/EcoRV sites in HcRed1-pFLAG CMV 5a vector. Excised bands were purified and used for ligation, and then transformed into DH5 $\alpha$  competent cells. NF- $\kappa$ B is a transcription factor that is activated by TRAF6 signaling. TRAF6 activity was tested by co-transfecting the TRAF6HcRed1 plasmid with an NF- $\kappa$ B /pGL2 Luciferase reporter. Activation of NF- $\kappa$ B was demonstrated by luciferase activity.

The TRAF6-HcRed1 protein shows similar sequestosomal localization patterns as that of a YFP-tagged TRAF6 protein and NF- $\kappa$ B activity. This construct can be used for signaling studies such as osteoclasto-synapsis which involves the regulation of RANK, Btk and TRAF6.

## Molecular tunneling transistor

By: Ramona Rahimian, Hadassah Shulman and Emil Prodan

Stern College for Women, Yeshiva University, New York, NY, 10016



The electrical resistance of insulating molecular wires attached to metallic electrodes depends drastically on the alignment of the insulating gap relative to the Fermi Level (see the figure on the left, depicting the local density of states for the particular molecular device shown on the top). Variations of this alignment by just 1 electron Volt can lead to variations of orders of magnitude in the electrical resistance of the device. Starting from this observation, we have explored the possibility of designing a tunneling molecular transistor, where the electrical resistance of the emitter-drain path is controlled by a gate potential applied between the main molecular device and a metallic ring surrounding it as in the figure below.

In the first stage of our research project, we generated the atomic configurations of several tunneling molecular transistors with metallic rings of different radii and lengths. Using the available numerical codes, we computed the electronic structure of the devices and demonstrated that for large enough radii, the electron states of the ring decouple from the electron states of the main structure, an important prerequisite for our molecular tunneling transistor. Furthermore, we explored different modalities of applying a gate voltage between the ring and the main structure and we mapped the effect of the gate voltage on the alignment of the insulating gap relative to the Fermi Level.



## Directives in narrative therapy

By: Esther Rollhaus and Robin Freyberg

Stern College for Women, Yeshiva University, New York, NY 10016

Previous research has shown that narrative construction leads to emotional and cognitive advancements in mental functioning (Smyth 1998). Like in successful psychotherapy, writing provides the forum for emotional expression and regulation. Research demonstrates that the way individuals express themselves, usually dictated by instructions on a writing task, is highly significant in determining the therapeutic outcome (Kerner & Fitzpatrick 2007). According to recent research results, individuals who write about achievement themes when asked to free-write display higher measures of psychological adjustment (Freyberg, Freyberg, Barnhill, Ferrando, 2008). While that phenomenon may be explained by several factors, the current researchers propose that the intentional manipulation of writing directives may gear participants to write about achievements, thereby promoting increased psychological well-being. The researchers intend to provide instructions that prompt individuals to write about achievement themes or to free-write. They expect that subjects directed to write about achievement themes may yield higher measures of mood and cognitive states as compared to basic free-writing participants. The research has important implications for the manipulation of the directives in narrative therapy to achieve desired mental health outcomes.

## Identification and quantification of peptides in hippocampal tissue of PC7 knockout mice

By: Chava Ruderman<sup>1</sup>, Jon Wardman<sup>2</sup>, Annik Prat<sup>3</sup> and Lloyd Fricker<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Dept. of Pharmacology, Albert Einstein College of Medicine, Bronx, NY 10461; <sup>3</sup>Clinical Research Institute of Montreal, Quebec, Canada

Pro-protein convertases (PCs), proteases that cleave peptide precursors to their intermediate forms, are implicated in multiple pathologies, including cancer, obesity, diabetes and neurodegenerative diseases. To investigate their individual functions, knockout (KO) mouse models have been developed for all nine PCs, with resulting phenotypes ranging widely from no observable effect to embryonic lethality. Only for the PC7 KO has no phenotype been observed. To determine whether levels of peptides in hippocampal tissue underwent changes in PC7 KO mice, a peptidomics method was used to identify native forms of peptides and quantify their levels. Samples of hippocampal tissue from five wild-type mice and three PC7 KO mice were labeled with isotopic tags and then combined and analyzed with a mass spectrometer, and relative peak intensities were used to determine abundance of the peptide. Twenty-four peptides were identified; of those, ten were neuropeptides or other secretory pathway peptides, and the rest were from cytosolic proteins. Seven secretory pathway peptides as well as two other peptides showed a decrease in the KO mice, indicating that PC7 may, to some extent, play a role in peptide processing. Variable decreases in different forms of the same peptide imply that PC7 is involved at the level of post-translational modification. Further studies of peptide changes in PC7 KO animals are needed to replicate these results with additional animals and to examine other brain areas, with the goal of ultimately confirming the function of PC7 and potentially elucidating the mechanism of its processing capabilities.

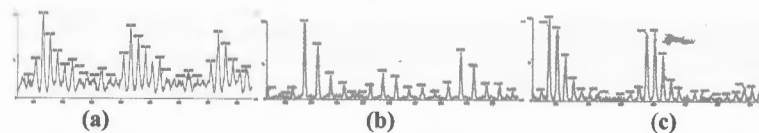


Fig. 1 (a) No change in KO. The peaks are approximately the same height, indicating no down-regulation in the KO. Peptide was identified as a myelin basic protein fragment (Ac-ASQKRPSQRSKYLATASMD) (b) Decrease in KO. The middle peak (KO) is substantially lower than those on either side. Peptide was identified as a proenkephalin fragment (YGGFMRF) (c) Variable controls. The control groups are not of uniform height, even considering that WT-1 was a pool of 3 mice and WT-2 a pool of 2 mice. Thus, levels of this peptide, a myelin basic protein fragment (Ac-ASQKRPSQRSKYLATA), vary from mouse to mouse.

## Developing a computational protocol to evaluate binding affinity of ligands to molecules

By: Lori Schoenbrun and Dr. Chaya Rapp

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

Drugs often come in the form of a ligand that binds to a receptor to either inhibit or increase the activity of the receptor. Often there are multiple, similar ligands that act to carry out this same action. These different ligands often share a common stem but have alternative side groups that affect how well they bind to the receptor. If a ligand binds very well to a receptor, it is highly potent, and less ligand is necessary to carry out the same job as that of a ligand with inferior binding affinity. The binding ability of a ligand to a receptor is measured using an  $IC_{50}$  value; this is a value that denotes the amount of ligand necessary to bind 50% of the receptors in a sample.

We attempted to develop a computational method to evaluate this ligand binding affinity with a receptor. Calculating binding energies on the computer is a cheaper, faster and easier method and could lead to a more efficient method of drug development. In this study we chose documented research containing the measured  $IC_{50}$  values of a series of ligands with a common stem, one being an available crystal structure archived in the protein database. We built the ligands in Maestro Academic Campaign using the downloaded protein database crystal as a base. These ligands, along with the receptor, were then optimized using ligprep. Rotatable bonds were defined and then each ligand was docked in PLOP (Protein Local Optimization Program). This was done by overlaying the stem atoms and tethering the other atoms.

The resulting energies were then calculated and the results were plotted against the wet lab's measured  $IC_{50}$  values and the correlation coefficient was calculated (Figure 1). Our results showed that the calculated binding energies of the inhibitors of the spleen tyrosine kinase, the series sharing the same stem as 3AO1, has a .80 correlation coefficient with the measured  $IC_{50}$  values of this series. Future studies will expand the results by studying more cases of inhibitory and activating ligands and will identify any factors that prevent the series from being properly ranked. This will include predicting protonation states and bond-rotation in the receptor protein.

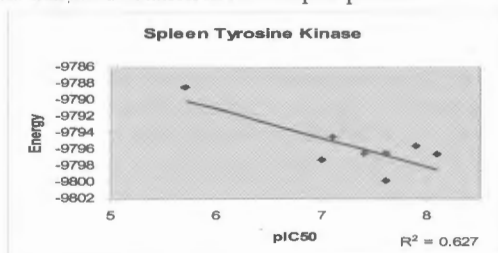


Figure 1. Theoretical results vs. experimental results for spleen tyrosine kinase.

## Sequencing the L1PA4 line element at the 9p21.3 risk locus for CAD

By: Leah Schweitzer<sup>1</sup>, Ryan Taylor<sup>2</sup> and Alexandre F.R. Stewart, Ph.D.<sup>2</sup>

<sup>1</sup>Stern College For Women, Yeshiva University, New York, NY 10016; <sup>2</sup>University of Ottawa Heart Institute, Ottawa, Canada

Coronary artery disease (CAD) affects 13 million Americans each year and is a major cause of morbidity and mortality. It is well documented that family history plays a large role in the CAD phenotype. In 2007, the results of three Genome Wide Association Studies (GWAS) were published<sup>1-4</sup> and have since then been replicated many times. These studies used elderly healthy controls and cases with diagnosed CAD and put 500,000 to 1 million markers across the genome. The studies looked at the frequencies of markers in cases versus controls. The results of these studies showed a high segregation frequency among cases versus controls, which indicated a risk conferring variant.

These variants were shown to occur in what is called a "gene desert," a region that has no annotated gene associated with it, which left the researchers with some unanswered questions. Still left unknown was how the variant mediated its effect and whether or not the variants that were found were the actual causal variants themselves, or whether they were surrogates of the causal regions that may be found up or downstream of the variants. An important detail found was that there were single nucleotide polymorphisms (SNPs) that spanned a 58 kilobase region in a vicinity which showed a high level of correlation to CAD. This region is located at 9p21.3.

Within the 9p21 risk locus there are two long interspersed nuclear elements (LINEs), L1PA4 and L1P1. The LINEs are highly repetitive regions of sequence, spanning about 8000 base pairs, flanked by two well known reference SNPs, rs10738607 and rs2891168, of the 9p21.3 risk haplotype. It is possible that this region may hold some important variations with regards to CAD. The L1PA4 LINE is also present at 12p12 and 12q24.3.

By sequencing the DNA of patients with known genotypes, (risk homozygotes, non-risk homozygotes, and heterozygotes) the primary objective was to determine if there are any sequence variants or SNPs in the LINE which correlate with each specific genotype. If a correlation was found, further investigation would be necessary to determine whether these variants have a weaker or stronger association with the CAD phenotype than the reference SNPs. If they were found to have a stronger association with the phenotype of interest, then it would be possible that the reference SNPs are just surrogates and the LINE variants are the causal variants

Due the repetitive nature of LINE elements they are very difficult to sequence by regular procedures. However, since it is possible that this LINE may hold some important variations with regards to CAD it was necessary to find alternate methods. Long Range PCR was used to amplify a fragment 11, 167 base pairs long, containing the

two LINEs and the reference SNPs, which was followed by cloning of the PCR products and sequencing. Two independent clones were sequenced and novel variants were identified in the LIPA4 LINE. A novel sequence variant of the risk homozygote clone was found to truncate an open reading frame (ORF) for reverse transcriptase by five amino acids at the C-terminus. The functional relevance of this discovery warrants further study.

#### References:

1. McPherson *et al.*, 2007, *Science* 316:1488-1491.
2. Helgadottir *et al.*, 2007, *Science* 316:1491-1493.
3. Wellcome Trust Case Control Consortium, 2007, *Nature Genetics* 39:1329-1337.
4. Samani *et al.*, 2007, *New England Journal of Medicine*, 357:443-453.

## A review of the literature on the psychological effects of 9/11 in children

By: R. Sonenberg and T. DiLorenzo

Stern College for Women, Yeshiva University, New York, NY 10016

Research on the psychological effects of 9/11 in children has revealed high rates of PTSD, agoraphobia, and separation anxiety disorder, following 9/11. Several risk factors for the development of these disorders were identified. Having a family member directly exposed to the attack was the factor most highly associated with disorders. Findings also showed that the greater children's exposure was to the attack, whether direct or indirect, the more likely they were to be diagnosed with one of these disorders. For example, children who personally witnessed the attacks showed greater symptoms of agoraphobia, SAD, and PTSD. Additionally, children who reported pre-attack traumatic exposure or who were more stressed and anxious, had more psychological symptomatology. Another consistent finding was the relationship between parents' and children's post-attack symptoms. That is, children whose parents had PTSD or depression had greater odds of having severe post-traumatic stress responses themselves. Lastly, being African American or Hispanic, rather than White, was associated with having disorders such as separation anxiety, PTSD, agoraphobia, and panic attacks. Results of studies examining the association between psychological symptoms and gender, age, and coping styles were inconsistent. This review demonstrates the adverse impact 9/11 has had on children and identifies risk factors for the development of psychopathology after exposure to a traumatic event. Intervention efforts tailored to those with these risk factors should be developed and implemented.



## Development of an *in vivo* screen to identify novel regulators of tumor growth and metastasis

By: Tirtza Spiegel<sup>1</sup>, Pamela Boimel<sup>2</sup>, Cristian Cruz<sup>2</sup> and Jeffrey Segall<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY 10461

Metastasis is the spread of neoplastic cells from a primary tumor site to secondary organs and involves angiogenesis, degradation of the basement membrane, invasion, intravasation, and extravasation. Ninety percent of deaths from tumors are due to metastasis, therefore study of metastasis patho-physiology is crucial. Previously 28 genes, identified to be correlated with patient survival across three clinical breast cancer microarray studies, were tested for their ability to regulate tumor growth and/or metastasis in SCID mice, using a lentiviral shRNA screen approach. From this screen we identified the homeobox 2 gene, which enhanced tumor growth both in the screen and for the individual cell line when downregulated. HOXB2 as well as other genes evaluated in the shRNA screen will be overexpressed to screen for regulators of metastasis and tumor growth with an open reading frame (ORF) pool. Quantitative Real-Time PCR (qRT-PCR) primers were designed to be used to determine the changes in the proportion of human breast cancer cells overexpressing up to 28 different genes after growth in the primary tumor and metastasis to the lungs. We have been analyzing the sensitivity as well as the specificity of the primers to detect their respective genes using qRT-PCR. Many of the primers had low specificity and seemed to prime against other ORFs, possibly due to contamination, primer dimers, and/or sequence overlap. We are currently evaluating *in vitro* growth of the HOXB2 knockdown cell line compared to the overexpression cell line and are comparing this to *in vivo* tumor growth curves. In preliminary studies HOXB2 gene had little effect on *in vitro* growth, although it seemed to increase primary tumor growth *in vivo*.

### Acknowledgements:

Thank you to the Roth Summer Research Fellowship Committee for funding and the Segall lab for an enjoyable and educational experience.

## Does MRI screening have a negative psychological effect on women who carry the BRCA gene?

By: Tirtza N. Spiegel and Terry DiLorenzo

Stern College for Women, Yeshiva University, New York, NY 10016

Although prophylactic surgery almost eliminates the risk of breast cancer for women with BRCA mutations, most of these very high risk women opt for intensive breast surveillance with annual MRI and mammography. However, there is a 26% possibility of being recalled for additional imaging due to the low specificity of MRI. We sought to determine whether MRI based surveillance caused additional long term anxiety, depression, and/or breast cancer worry/distress, in women who were recalled for additional imaging. Participants (n=55, median age, 40) completed the HADS scale, the Lerman BCWS the Trask WIS scales, and the MBSS scales, and additional questions on screening anxiety and quality of life: 1 – 2 weeks before and 4 – 6 weeks and 6 months after imaging. At baseline, 49% women had elevated global anxiety, 15% had depression symptoms, and none had elevated breast cancer distress. Eighteen were recalled for additional imaging, including 3 who had biopsies. There were no significant increases over time in global anxiety, depression, breast cancer specific distress, or modality specific anxiety for either the total sample or those who were recalled for additional imaging. Age, recall, baseline HADS and WIS scores, and previous breast cancers did not predict an elevation in anxiety or distress over time. Despite its high false positive rate, MRI-based screening had no adverse psychological effects on women with BRCA mutations in this study.

## The multi-faceted Jew: A study on the integration of the interdependent self and the independent self in Jews in America

By: Ester Stiefel and Robin Freyberg

Stern College for Women, Yeshiva University, New York, NY 10016

The study will focus on how Jews in America integrate the traits of independent and interdependent self at work and at synagogue (Markus & Kitayama, 1991). The current study will be conducted in two different locations and test two different populations. The participants will complete the Religious Orientation Scale (Allport & Ross, 1967) and the Relational-Interdependent Self-Construct Measure (Cross, Gore, & Morris, 2003). Participants will be recruited from Jewish synagogues as well as workplaces in New York City. Analyses will examine whether differences in independent and interdependent orientations vary by location and affiliation of Judaism. After testing different affiliations of Judaism it is predicted that it will be found that in both environments there will be a balanced integration of both independent and interdependent orientations. It is expected that stronger independent orientations will be observed for Jews at work whereas stronger interdependent traits will be observed for Jews at synagogue. Also, stronger religious affiliation is expected to indicate stronger interdependence (Cohen & Hill, 2007). Limitations of the design and directions for future studies on the topic of the integration of independence and interdependence in the collectivistic Jewish culture living in the independent culture of America will be addressed.

## The effects of age on object memory and spatial abilities in women

By: Danielle Taylor and Dr. Lauren Harburger

Stern College for Women, Yeshiva University, New York, NY 10016

The goal of the present study was to determine if aged women demonstrate cognitive decline on tests of object memory and spatial ability compared to young women. Thirty-two young undergraduate women (ages 19-24) were compared to fifteen aged independent living women (ages 71-90). An object array task was used to measure object memory and a mental rotation test was used to measure spatial ability. The object array task required participants to study black and white drawn objects and then to circle objects that they believed had moved positions or were novel to the array. The mental rotations test required participants to match objects that were rotated into different positions. Preliminary results suggest that aged women perform similar to young women on all object array conditions. However, aged women perform worse on the mental rotation test relative to young women. Therefore, our results thus far suggest that there is no age-related decline in object memory, but spatial ability appears to decline with age in women.

Sociodemographic and HPV risk factor assessment of early-adopting users of the HPV vaccine in the late catch-up population (ages 19-26) in an ethnically diverse, urban population

By: Jessica Tugetman<sup>1</sup>, Laura Reimers<sup>3</sup>, Mindy Ginsburg<sup>3</sup>, Nisha Sandesara<sup>2</sup>, Dennis Yi-Shin Kuo<sup>2,3</sup> and Mark H. Einstein<sup>2,3</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Department of Obstetrics & Gynecology and Women's Health, Montefiore Medical Center, Bronx, NY 10461; <sup>3</sup>Albert Einstein Cancer Center, Albert Einstein College of Medicine, Bronx, NY 10461

The goals of this study were to investigate the sociodemographic and HPV risk factors of early-adopting users of the HPV vaccine in the late 'catch-up' population (ages 19-26) in an ethnically diverse, urban population; to compare this population with the surrounding community and participants enrolled in the large Phase III vaccine trials; and to use modeling to estimate the efficacy of the HPV vaccine in this population.

All patients in an ethnically diverse, urban population who sought vaccination at a large, centralized HPV vaccine clinic, from March 2007 to August 2008, were asked to complete extensive questionnaires for HPV risk assessment which included questions regarding sexual history and contraceptive practices, smoking, and other major factors. After institutional review board approval, all HIPAA-unidentifiable sociodemographic and HPV risk factor data were abstracted from the charts and questionnaires. Data were compared with those for the surrounding community data using the 2007 Youth Risk Behavior Surveillance System (YRBSS) and comparisons were also made to the published data from the Phase III HPV vaccination trials.

Three hundred seventy-five women aged 19-26 visited the vaccine clinic during this time period. Nearly half (42%) of the women who visited the vaccine clinic reported having had an abnormal Pap smear. These women, who were comparable to the surrounding community with respect to sociodemographic and HPV risk factor status, reported having had a significantly higher number of sexual partners than those on both the FUTURE and PATRICIA trials ( $p<0.01$ ), with 31% reporting five or more sexual partners. Based on sexual exposures and HPV risk factors, modeling indicated that the efficacy of the HPV vaccine in this population is considerably lower than published Phase III data.

These data suggests the early users of the HPV vaccine in the late catch-up population do not resemble those on the Phase III clinical trials and the generalizability of the HPV vaccine efficacy, if any at all, in an urban, ethnically diverse population of 19-to 26-year-olds should be questioned. Real-time prospective data collection for efficacy is imperative to further maximize HPV vaccination policies, recommendations, and cost-utilization.

Time to first dose oral antipsychotics on behavioral medicine units

By: Helen A. Unger<sup>1</sup>, Renee Striker, Pharm.D., BCPS, BCPP<sup>2</sup> and Heather Pennington, RN, BSN<sup>3</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2,3</sup>Huron Hospital, East Cleveland, Ohio, 44112

Huron Hospital is home to a 30-bed Behavioral Medicine Unit and a 10-bed Inpatient Detoxification Unit. Currently, the hospital utilizes the MyPractice/Epic System with a computerized physician order entry (CPOE) system to order, verify, and document medication administration. In addition, the two units are equipped with Pyxis MedStation, an automated dispensing cabinet (ADC), to facilitate medication administration. In the fall of 2009, Huron Hospital's Behavioral Medicine Unit is scheduled to receive Pyxis Profile, a software upgrade to the current ADC, aimed to reduce the time between prescription order entry and medication administration. This study was conducted as a retrospective chart review to evaluate the current delivery process of medication before the new software is installed. Data was collected retrospectively from the electronic Medication Administration Record (eMAR) and pharmacy dispensing history; this data included subject admission time, prescription order time, pharmacist verification time, and medication administration time. 100 charts were reviewed from subjects admitted to the two units between 3/21/09 and 6/4/09. The results were calculated to be the following:

Order Entry to Medication Administration	3 hrs 54 min
Order Entry to Pharmacist Verification	5 min
Pharmacist Verification to Medication Delivery	45 min
Medication Delivery to Medication Administration	3 hrs 4 min

A similar study is recommended, after the installation of Pyxis Profile, to assess the impact of the software. This secondary study should be done 5 to 6 months after the implementation of the software, to allow for new data to be available. All inclusion criteria should be maintained.

Identification of markers for autophagy in serum

By: Rebecca Weiss<sup>1</sup>, Cong Zhang<sup>2</sup> and Ana Maria Cuervo<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Department of Developmental and Molecular Biology, Albert Einstein College of Medicine, Bronx, NY 10461

Autophagy refers to the lysosomal degradation of intracellular components such as soluble proteins (both damaged and functional), whole organelle structures and particulate matter (e.g. protein aggregates). This process is vital in maintaining the cell's homeostatic balance by preventing the abnormal and potentially harmful accumulation of intracellular debris and by allowing for the continuous turnover of macromolecules. Recently, apparent alterations in the normal autophagic activity of the cell have been linked to aging and various forms of cancer, neurodegenerative diseases, and muscular disorders. The study of autophagy in humans is currently limited; the determination of changes in autophagic activity can only be performed upon the isolation of specific tissues of interest.

In this study, we intend to identify (i) if various autophagy-related proteins can be detected circulating in the blood and (ii) if changes in the blood levels of these proteins correlate with changes in autophagic activity. Such findings could enable these proteins to be used as diagnostic markers for the autophagic activity of an organism as well as prognostic tools for the development of various diseases.

We have used blood samples from rats and mice under fed, starved, and oxidative stress conditions. Upon serum isolation and protein quantification, samples were subjected to SDS-PAGE and Western blot for the autophagic proteins of interest.

Our results show that: (i) different autophagic proteins can be detected in serum; (ii) some of the autophagic proteins represent modified (i.e. different molecular weight) forms of the intracellular variants; (iii) there is an increase in autophagic protein levels in serum under starvation and oxidative stress conditions, and these protein levels seem to gradually rise overtime as hours of starvation increase.

Although further studies are necessary, based on our findings we conclude that the analysis of autophagic proteins in blood is possible and that these proteins could prove to be a promising marker for the autophagic status of a whole organism.

Acknowledgments:

This research was supported by NIH/NIA grant P01 AG031782-01 (AMC), the Stern-Einstein Research Connection (SERC) 2009, and the Summer Undergraduate Research Program at Albert Einstein College of Medicine.

Validation of an automated extraction method and platform to diagnose novel swine influenza

By: Shoshana Zitter<sup>1</sup>, Darren Bryk<sup>2</sup>, Mamka Narlieva<sup>2</sup>, Ivy Akid<sup>2</sup>, Qiulu Pan<sup>2</sup>, Tylys Chang<sup>2</sup> and Amy Fox<sup>2</sup>

<sup>1</sup>Stern College for Women, Yeshiva University, New York, NY 10016; <sup>2</sup>Montefiore Medical Center, Bronx, NY 10467

Novel swine influenza was identified in the United States in April 2009 and subsequently escalated to a pandemic. It is expected that swine influenza will dramatically increase in the fall. The purpose of this study was to develop and validate a high throughput automated molecular platform in order to diagnose novel swine influenza with faster turnaround time.

The manual method to extract viral RNA was validated against specimens run by the New York City (NYC) Department of Health (DOH) utilizing the CDC protocol. Viral RNA from viral transport media of 22 patients that was previously run by NYC DOH was also manually extracted and run on the ABI 7000 (Abbott). It was then run on the Abbott m2000sp, an open clinical assay platform. The open platform was adapted to extract influenza RNA. The viral RNA was extracted using the automated platform and then run on RT-PCR (Abbott) using the CDC approved primers and probes. The primers and probes were for influenza A, swine influenza A, swine H1N1, and an internal positive control, RnaseP. Cycle number threshold (Ct) < 37 indicated a positive result.

One sample was negative for all, 15 samples were confirmed as swine influenza, and 6 were positive for influenza A. The results of the 22 cases were consistent in all three assays. (See Table 1)

Table 1: Results of the Three Assays

	NYC DOH	Manual	Automated
Negative	1	1	1
Influenza A	6	6	6
Swine Flu	15	15	15

These results suggest that the automated platform can be utilized for the accurate diagnosis of influenza. Additional tests are in progress in order to validate this platform for clinical use. This platform, once validated, will allow for a rapid throughput of patient samples in the face of an influenza pandemic.

Acknowledgements:

SURP 2009 for support. Dr Gavin Cloherty and Dr. Danijela Lucic of Abbott Molecular Laboratories for advice and technical assistance. Dr. Oleszko and Dr. Fu of the NYC DOH for their guidance.





