

# Final Progress Report for Research Projects Funded by Health Research Grants

Instructions: Please complete all of the items as instructed. Do not delete instructions. Do not leave any items blank; responses must be provided for all items. If your response to an item is “None”, please specify “None” as your response. “Not applicable” is not an acceptable response for any of the items. There is no limit to the length of your response to any question. Responses should be single-spaced, no smaller than 12-point type. The report **must be completed using MS Word**. Submitted reports must be Word documents; they should not be converted to pdf format. Questions? Contact Health Research Program staff at 717-783-2548.

1. **Grantee Institution:** Thomas Jefferson University
2. **Reporting Period (start and end date of grant award period):** 1/1/2009-12/31/2012
3. **Grant Contact Person (First Name, M.I., Last Name, Degrees):** Theodore F. Taraschi, Ph.D.
4. **Grant Contact Person’s Telephone Number:** 215-955-3900
5. **Grant SAP Number:** 4100047652
6. **Project Number and Title of Research Project:** 1 - Role and Regulation of Focal Adhesion Kinase in Melanoma
7. **Start and End Date of Research Project:** 1/1/09-06/30/12
8. **Name of Principal Investigator for the Research Project:** Andrew Aplin, Ph.D.
9. **Research Project Expenses.**

9(A) Please provide the total amount of health research grant funds spent on this project for the entire duration of the grant, including indirect costs and any interest earned that was spent:

\$ 560,616.86

9(B) Provide the last names (include first initial if multiple individuals with the same last name are listed) of **all** persons who worked on this research project and were supported with health research funds. Include position titles (Principal Investigator, Graduate Assistant, Post-doctoral Fellow, etc.), percent of effort on project and total health research funds expended for the position. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project	Cost
Aplin	Professor	5% Yr 1,2; 15% Yr 3	\$48,442.60
Hu	Student	100% Yr 1	\$9,731.01
Katiyar	Post Doc Fellow	50% Yr 1	\$5,617.47
Dadpey	Research Tech A	100% Yr 1,2,3	\$102,339.34
Weiss	Post Doc Fellow	75% Yr 1,2,3	\$71,316.60
Basile	Doctoral Student	100% Yr 2,3	\$46,287.07
Rajput	Student	100% Yr 3	\$2,926.00

9(C) Provide the names of **all** persons who worked on this research project, but who *were not* supported with health research funds. Include position titles (Research Assistant, Administrative Assistant, etc.) and percent of effort on project. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project
None		

9(D) Provide a list of **all** scientific equipment purchased as part of this research grant, a short description of the value (benefit) derived by the institution from this equipment, and the cost of the equipment.

Type of Scientific Equipment	Value Derived	Cost
None		

**10. Co-funding of Research Project during Health Research Grant Award Period.** Did this research project receive funding from any other source during the project period when it was supported by the health research grant?

Yes \_\_\_\_\_ No X

If yes, please indicate the source and amount of other funds:

**11. Leveraging of Additional Funds**

11(A) As a result of the health research funds provided for this research project, were you able to apply for and/or obtain funding from other sources to continue or expand the research?

Yes x No \_\_\_\_\_

If yes, please list the applications submitted (column A), the funding agency (National Institutes of Health—NIH, or other source in column B), the month and year when the application was submitted (column C), and the amount of funds requested (column D). If

you have received a notice that the grant will be funded, please indicate the amount of funds to be awarded (column E). If the grant was not funded, insert “not funded” in column E.

Do not include funding from your own institution or from CURE (tobacco settlement funds). Do not include grants submitted prior to the start date of the grant as shown in Question 2. If you list grants submitted within 1-6 months of the start date of this grant, add a statement below the table indicating how the data/results from this project were used to secure that grant.

A. Title of research project on grant application	B. Funding agency (check those that apply)	C. Month and Year Submitted	D. Amount of funds requested:	E. Amount of funds to be awarded:
Novel mechanisms of resistance to RAF inhibitors in melanoma	<input type="checkbox"/> NIH <input checked="" type="checkbox"/> Other federal (specify: Department of Defense) <input type="checkbox"/> Nonfederal source (specify:_)	2010	\$75,000	\$75,000

11(B) Are you planning to apply for additional funding in the future to continue or expand the research?

Yes  X  No \_\_\_\_\_

If yes, please describe your plans: NIH R01 submission, this cycle Feb 2013

**12. Future of Research Project.** What are the future plans for this research project?

We are continuing to analyze resistance to RAF inhibitor but are proceeding with *in vivo* methods.

**13. New Investigator Training and Development.** Did students participate in project supported internships or graduate or post-graduate training for at least one semester or one summer?

Yes  X  No \_\_\_\_\_

If yes, how many students? Please specify in the tables below:

	Undergraduate	Masters	Pre-doc	Post-doc
Male				2
Female				
Unknown				
<b>Total</b>				<b>2</b>

	Undergraduate	Masters	Pre-doc	Post-doc
Hispanic				
Non-Hispanic				2
Unknown				
<b>Total</b>				<b>2</b>

	Undergraduate	Masters	Pre-doc	Post-doc
White				1
Black				
Asian				1
Other				
Unknown				
<b>Total</b>				<b>2</b>

**14. Recruitment of Out-of-State Researchers.** Did you bring researchers into Pennsylvania to carry out this research project?

Yes \_\_\_\_\_ No X

If yes, please list the name and degree of each researcher and his/her previous affiliation:

**15. Impact on Research Capacity and Quality.** Did the health research project enhance the quality and/or capacity of research at your institution?

Yes \_\_\_\_\_ No X

If yes, describe how improvements in infrastructure, the addition of new investigators, and other resources have led to more and better research.

**16. Collaboration, business and community involvement.**

16(A) Did the health research funds lead to collaboration with research partners outside of your institution (e.g., entire university, entire hospital system)?

Yes \_\_\_\_\_ No X

If yes, please describe the collaborations:

16(B) Did the research project result in commercial development of any research products?

Yes \_\_\_\_\_ No X

If yes, please describe commercial development activities that resulted from the research

project:

16(C) Did the research lead to new involvement with the community?

Yes \_\_\_\_\_ No  X

If yes, please describe involvement with community groups that resulted from the research project:

**17. Progress in Achieving Research Goals, Objectives and Aims.**

List the project goals, objectives and specific aims (as contained in the grant agreement). Summarize the progress made in achieving these goals, objectives and aims for the period that the project was funded (i.e., from project start date through end date). Indicate whether or not each goal/objective/aim was achieved; if something was not achieved, note the reasons why. Describe the methods used. If changes were made to the research goals/objectives/aims, methods, design or timeline since the original grant application was submitted, please describe the changes. Provide detailed results of the project. Include evidence of the data that was generated and analyzed, and provide tables, graphs, and figures of the data. List published abstracts, poster presentations and scientific meeting presentations at the end of the summary of progress; peer-reviewed publications should be listed under item 20.

This response should be a DETAILED report of the methods and findings. It is not sufficient to state that the work was completed. Insufficient information may result in an unfavorable performance review, which may jeopardize future funding. If research findings are pending publication you must still include enough detail for the expert peer reviewers to evaluate the progress during the course of the project.

Health research grants funded under the Tobacco Settlement Act will be evaluated via a performance review by an expert panel of researchers and clinicians who will assess project work using this Final Progress Report, all project Annual Reports and the project's strategic plan. After the final performance review of each project is complete, approximately 12-16 months after the end of the grant, this Final Progress Report, as well as the Final Performance Review Report containing the comments of the expert review panel, and the grantee's written response to the Final Performance Review Report, will be posted on the CURE Web site.

**There is no limit to the length of your response. Responses must be single-spaced below, no smaller than 12-point type. If you cut and paste text from a publication, be sure symbols print properly, e.g., the Greek symbol for alpha ( $\alpha$ ) and beta ( $\beta$ ) should not print as boxes ( $\square$ ) and include the appropriate citation(s). DO NOT DELETE THESE INSTRUCTIONS.**

## Overview

Malignant melanoma is the deadliest form of skin cancer and is poorly treatable. Depth of melanoma invasion into the dermis is used as a clinical determinant for prognosis. The long-term goal is to determine mechanisms underlying invasive growth of human melanomas. Mutations in the B-RAF gene are found in 50-70% of melanomas, and mutant B-RAF activation of the MEK-ERK1/2 pathway is required for invasion and resistance to apoptosis. Additionally, signaling from interaction with the surrounding extracellular matrix promotes invasion. Our preliminary data show that B-RAF-MEK-ERK1/2 signaling controls the phosphorylation of focal adhesion kinase (FAK) at serine 910. FAK localizes to sites of cell interaction with its extracellular matrix. Since these interactions regulate cell invasion, the goal of this project is to determine the role of serine 910 phosphorylation of FAK in melanoma cell invasion. Furthermore, an extension of these studies was to analyze mechanisms of resistance to RAF inhibitors in melanoma and determine whether FAK phosphorylation is altered in resistant cells.

## **Summary of Research Completed**

Mutations within the serine kinase, BRAF, occur in approximately two-thirds of melanomas. The majority of mutations in BRAF lead to hyper-activation of the MEK-ERK1/2 pathway. In vitro and in vivo xenograft studies demonstrating a requirement for B-RAF in the proliferation, survival, and invasion of mutant BRAF melanoma cells have formed the pre-clinical basis for RAF inhibitors in clinical trials. Vemurafenib (PLX4032/RG7204), a selective inhibitor of mutant BRAF recently completed phase III randomized trials. PLX4032 elicited an objective response of 48%, compared to the 5% partial response seen with dacarbazine (standard of care). Furthermore, PLX402 progression-free survival was 5.3 months while 1.6 months of progression-free survival was observed with dacarbazine. Although PLX4032 has performed better than the standard of care treatment for metastatic melanoma, patients relapse and new metastatic lesions are detected. In most instances relapse tumors have reactivation of the MEK-ERK1/2 pathway.

The goal of this project is to determine effects of mutant B-RAF-dependent phosphorylation of the focal adhesion kinase (FAK) in the malignant properties of melanoma cells. We have demonstrated in preliminary data that phosphorylation of FAK at serine 910 is dependent on active B-RAF signaling in human melanoma cells. In our continuing efforts to determine the role of serine phosphorylation in focal adhesion kinase (FAK) localization, we analyzed serine 910 phosphorylation in PLX-resistant mutant B-RAF melanoma cells. For these studies we utilized PLX4720, the pre-clinical analog of PLX4032. Chronic treatment with PLX4720 led to the emergence of cells (WM793-Res) resistant to PLX4720 induced cell cycle arrest (data shown in prior report). Interestingly, these resistant cells displayed a characteristic morphology; they were more elongated than WM793 parental cells. Actin staining, with TRITC-phalloidin, revealed that resistant cells exhibit fewer cortical actin filaments compared to their parental counterparts. From these screens, we isolated two sub-populations of cells with acquired resistance to PLX4720.

One sub-population of resistant cells was characterized by a secondary mutation in NRAS, specifically Q61K NRAS. In these BRAF<sup>V600E</sup>/NRAS<sup>Q61K</sup> co-expressing cells, re-activation

of the ERK1/2 pathway during PLX4720 treatment was dependent on NRAS. In particular, phosphorylation of FAK at serine 910 was reactivated by mutant NRAS. We went on to show that expression of mutant NRAS in parental BRAF<sup>V600E</sup> cells was sufficient to by-pass PLX4720 effects on ERK1/2 signaling, entry into S phase and susceptibility to apoptosis in a manner dependent on the RAF binding site in NRAS. ERK1/2 activation in BRAF<sup>V600E</sup>/NRAS<sup>Q61K</sup> cells required CRAF only in the presence of PLX4720, indicating a switch in RAF isoform requirement. Both ERK1/2 activation and resistance to apoptosis of BRAF<sup>V600E</sup>/NRAS<sup>Q61K</sup> cells in the presence of PLX4720 was partially dependent on SHOC-2/Sur-8, a RAS-RAF scaffold protein. These data show that NRAS mutations confer resistant to RAF inhibitors in mutant BRAF cells and alter RAF isoform and scaffold molecule requirements to re-activate the ERK1/2 pathway. These data were recently published:

Kaplan, F.M., Kugel, C.H., Dadpey, N., Shao, Y., Abel, E.V., and Aplin, A.E. (2012) SHOC2 and CRAF mediate ERK1/2 reactivation in mutant NRAS-mediated resistance to RAF Inhibitor. *J. Biol. Chem* 287:41797-807 PMID: PMC3516728 [Available on 2013/12/7].

The other sub-population of PLX4720-resistant cells did not harbor a NRAS mutation or mutation on other component of the RAF-MEK-ERK1/2 pathway but rather was associated with up-regulation of the growth factor receptor, PDGF-R $\beta$ . Notably, tyrosine phosphorylation of FAK is enhanced in this resistant population. In this population, resistance was associated with a partial re-activation of ERK1/2 signaling, recovery of G1/S cell cycle events, and suppression of the pro-apoptotic BH3-only proteins, Bim-EL and Bmf. Preventing ERK1/2 re-activation with MEK inhibitors blocked G1-S cell cycle progression but failed to induce apoptosis or up-regulate Bim-EL and Bmf. Treatment with the histone deacetylase (HDAC) inhibitor, suberoylanilide hydroxamic acid (SAHA), led to de-repression of Bim-EL and enhanced cell death in the presence of PLX4720 or AZD6244 in resistant cells. These data indicate that acquired resistance to PLX4032/4720 likely involves ERK1/2 pathway re-activation as well as ERK1/2-independent silencing of BH3-only proteins. Furthermore, combined treatment of HDAC inhibitors and MEK inhibitors may contribute to overcoming PLX4032 resistance. These data were recently published:

Shao, Y, and Aplin A.E. (2012) BH3-only protein silencing contributes to acquired resistance to PLX4720 in human melanoma. *Cell Death Diff*. doi: 10.1038/cdd.2012.94. [Epub ahead of print]. PMID: PMC3504716 [Available on 2013/12/1].

We have continued these studies by analyzing the regulation of the pro-apoptotic protein Bmf in mutant BRAF melanoma cells. We have identified how mutant BRAF signaling interfaces with a distinct signaling pathway to control the Bmf transcript levels. These studies are currently being completed before the data will be compiled for manuscript submission.

**18. Extent of Clinical Activities Initiated and Completed.** Items 18(A) and 18(B) should be completed for all research projects. If the project was restricted to secondary analysis of clinical data or data analysis of clinical research, then responses to 18(A) and 18(B) should be “No.”

18(A) Did you initiate a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

\_\_\_\_\_ Yes  
  X   No

18(B) Did you complete a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

\_\_\_\_\_ Yes  
  X   No

**If “Yes” to either 18(A) or 18(B), items 18(C) – (F) must also be completed.** (Do NOT complete 18(C-F) if 18(A) and 18(B) are both “No.”)

18(C) How many hospital and health care professionals were involved in the research project?

\_\_\_\_\_ Number of hospital and health care professionals involved in the research project

18(D) How many subjects were included in the study compared to targeted goals?

\_\_\_\_\_ Number of subjects originally targeted to be included in the study  
\_\_\_\_\_ Number of subjects enrolled in the study

**Note:** Studies that fall dramatically short on recruitment are encouraged to provide the details of their recruitment efforts in Item 17, Progress in Achieving Research Goals, Objectives and Aims. For example, the number of eligible subjects approached, the number that refused to participate and the reasons for refusal. Without this information it is difficult to discern whether eligibility criteria were too restrictive or the study simply did not appeal to subjects.

18(E) How many subjects were enrolled in the study by gender, ethnicity and race?

Gender:

\_\_\_\_\_ Males  
\_\_\_\_\_ Females  
\_\_\_\_\_ Unknown

Ethnicity:

\_\_\_\_\_ Latinos or Hispanics  
\_\_\_\_\_ Not Latinos or Hispanics  
\_\_\_\_\_ Unknown

Race:

- American Indian or Alaska Native  
 Asian  
 Blacks or African American  
 Native Hawaiian or Other Pacific Islander  
 White  
 Other, specify: \_\_\_\_\_  
 Unknown

18(F) Where was the research study conducted? (List the county where the research study was conducted. If the treatment, prevention and diagnostic tests were offered in more than one county, list all of the counties where the research study was conducted.)

**19. Human Embryonic Stem Cell Research.** Item 19(A) should be completed for all research projects. If the research project involved human embryonic stem cells, items 19(B) and 19(C) must also be completed.

19(A) Did this project involve, in any capacity, human embryonic stem cells?

- Yes  
 No

19(B) Were these stem cell lines NIH-approved lines that were derived outside of Pennsylvania?

- Yes  
 No

19(C) Please describe how this project involved human embryonic stem cells:

**20. Articles Submitted to Peer-Reviewed Publications.**

20(A) Identify all publications that resulted from the research performed during the funding period and that have been submitted to peer-reviewed publications. Do not list journal abstracts or presentations at professional meetings; abstract and meeting presentations should be listed at the end of item 17. **Include only those publications that acknowledge the Pennsylvania Department of Health as a funding source** (as required in the grant agreement). List the title of the journal article, the authors, the name of the peer-reviewed publication, the month and year when it was submitted, and the status of publication (submitted for publication, accepted for publication or published.). Submit an electronic copy of each publication or paper submitted for publication, listed in the table, in a PDF version 5.0.5 (or greater) format, 1,200 dpi. Filenames for each publication should include the number of the research project, the last name of the PI, the number of the publication and an abbreviated research project title. For example, if you submit two publications for PI Smith for the “Cognition and MRI in Older Adults” research project (Project 1), and two

publications for PI Zhang for the “Lung Cancer” research project (Project 3), the filenames should be:

Project 1 – Smith – Publication 1 – Cognition and MRI

Project 1 – Smith – Publication 2 – Cognition and MRI

Project 3 – Zhang – Publication 1 – Lung Cancer

Project 3 – Zhang – Publication 2 – Lung Cancer

If the publication is not available electronically, provide 5 paper copies of the publication.

**Note:** The grant agreement requires that recipients acknowledge the Pennsylvania Department of Health funding in all publications. Please ensure that all publications listed acknowledge the Department of Health funding. If a publication does not acknowledge the funding from the Commonwealth, do not list the publication.

Title of Journal Article:	Authors:	Name of Peer-reviewed Publication:	Month and Year Submitted:	Publication Status (check appropriate box below):
1. Mechanisms of resistance to RAF inhibitors in melanoma.	Aplin, A.E., Kaplan, F. M. and Shao, Y.P.	J. Investigative Dermatol	Jan 2011	<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Published
2. Hyperactivation of MEK-ERK1/2 signaling and resistance to apoptosis induced by PLX4720 in mutant N-RAS melanoma cells	Kaplan, F., Shao, Y., Mayberry, M. and Aplin, A.E.	Oncogene	Feb 2010	<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Published
3. The wrath of RAFs: rogue behavior of B-RAF kinase inhibitors.	Kaplan, F.M., Mastrangelo, M.J. and Aplin, A.E.	J. Invest Dermatol	2010	<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Published
4. SHOC2 and CRAF mediate ERK1/2 reactivation in mutant NRAS-mediated resistance to RAF Inhibitor.	Kaplan, F.M., Kugel, C.H., Dadpey, N., Shao, Y., Abel, E.V., and Aplin, A.E.	J. Biol Chem	June 2012	<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Published
5. ERK2 phosphorylation of serine 77 regulates Bmf pro-apoptotic activity	Shao, Y. and Aplin A.E.	Cell Death and Disease	Feb 2011	<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input checked="" type="checkbox"/> Published
6. Finding the root of the problem: the quest to identify melanoma cells.	Abel, E.V. and Aplin, A.E.	Frontiers in Bioscience	2011	<input type="checkbox"/> Submitted <input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Published

20(B) Based on this project, are you planning to submit articles to peer-reviewed publications in the future?

Yes \_\_\_\_\_ No X \_\_\_\_\_

If yes, please describe your plans:

**21. Changes in Outcome, Impact and Effectiveness Attributable to the Research Project.**

Describe the outcome, impact, and effectiveness of the research project by summarizing its impact on the incidence of disease, death from disease, stage of disease at time of diagnosis, or other relevant measures of outcome, impact or effectiveness of the research project. If there were no changes, insert “None”; do not use “Not applicable.” Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

We have identified resistance mechanisms to RAF inhibitors in melanoma. Ultimately, this work could provide avenues to develop new therapeutic strategies for the treatment of melanoma. These avenues could be in combination with existing treatments, and may be particularly important in patients who develop resistance to initial treatments. Furthermore, a focus of this project is to discover a marker that will serve to identify particularly invasive, and thus aggressive, forms of melanoma.

**22. Major Discoveries, New Drugs, and New Approaches for Prevention Diagnosis and Treatment.** Describe major discoveries, new drugs, and new approaches for prevention, diagnosis and treatment that are attributable to the completed research project. If there were no major discoveries, drugs or approaches, insert “None”; do not use “Not applicable.” Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

Mechanistic understanding of resistance to RAF inhibitors in melanoma.

**23. Inventions, Patents and Commercial Development Opportunities.**

23(A) Were any inventions, which may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of work under this health research grant? Yes \_\_\_\_\_ No X \_\_\_\_\_

If “Yes” to 23(A), complete items a – g below for each invention. (Do NOT complete items a - g if 23(A) is “No.”)

a. Title of Invention:

b. Name of Inventor(s):

c. Technical Description of Invention (describe nature, purpose, operation and physical, chemical, biological or electrical characteristics of the invention):

d. Was a patent filed for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?

Yes\_\_\_\_\_ No\_\_\_\_

If yes, indicate date patent was filed:

e. Was a patent issued for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?

Yes\_\_\_\_\_ No\_\_\_\_

If yes, indicate number of patent, title and date issued:

Patent number:

Title of patent:

Date issued:

f. Were any licenses granted for the patent obtained as a result of work performed under this health research grant? Yes\_\_\_\_\_ No\_\_\_\_

If yes, how many licenses were granted?\_\_\_\_\_

g. Were any commercial development activities taken to develop the invention into a commercial product or service for manufacture or sale? Yes\_\_\_ No\_\_\_\_

If yes, describe the commercial development activities:

23(B) Based on the results of this project, are you planning to file for any licenses or patents, or undertake any commercial development opportunities in the future?

Yes\_\_\_\_\_ No\_\_X\_\_\_\_\_

If yes, please describe your plans:

**24. Key Investigator Qualifications.** Briefly describe the education, research interests and experience and professional commitments of the Principal Investigator and all other key investigators. In place of narrative you may insert the NIH biosketch form here; however, please limit each biosketch to 1-2 pages. *For Nonformula grants only – include information for only those key investigators whose biosketches were not included in the original grant application.*

NAME Andrew E. Aplin, Ph.D.		POSITION TITLE	
eRA COMMONS USER NAME aplina		Professor of Cancer Biology (tenured)	
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Bath, Bath, United Kingdom (UK)	B.Sc. (honors)	1992	Biochemistry
King's College, University of London, UK	Ph.D.	1996	Biochemistry
University of North Carolina-Chapel Hill	Postdoc	1996-1999	Pharmacology
University of North Carolina-Chapel Hill	Res. Assoc.	1999-2001	Pharmacology

## B. Positions and Honors

### Positions

1992	The Wellcome Trust Vacation Scholar, University of Bath, United Kingdom
1992-1996	Graduate Student, Institute of Psychiatry, King's College, London, UK
1996-1999:	Postdoctoral Fellow, Dept. of Pharmacology, Univ. North Carolina, Chapel Hill, NC
1999-2001:	Research Associate, Dept. of Pharmacology, Univ. North Carolina, Chapel Hill, NC
11/2001-3/2007	Assistant Professor, Center for Cell Biology & Cancer Research, Albany Medical College, Albany, NY.
3/2007-12/2008	Associate Professor, Center for Cell Biology & Cancer Research, Albany Medical College, Albany, NY.
12/2008 - 1/2012	Associate Professor (tenured 6/2010) Department of Cancer Biology, Kimmel Cancer Center, Thomas Jefferson University, Philadelphia, PA.
4/2010 - date	Secondary appointment in Department of Dermatology and Cutaneous Biology, Thomas Jefferson University.
1/2012 - date	Professor, Department of Cancer Biology, Kimmel Cancer Center, Thomas Jefferson University, Philadelphia, PA.

### Honors & Awards

The Wellcome Trust Vacation Scholarship (1992)  
 Recipient of a "Research Into Aging" Prize (1992-1995)  
 American Cancer Society Research Scholar Award (2008)

### Manuscript Reviewer

Associate Editor for Journal of Investigative Dermatology  
 Editorial board for Cancer Research  
 Editorial Advisory Panel member for the Biochemical Journal

Associate Editor-in-Chief, American Journal of Cancer Research

Reviewer for American Journal of Pathology, Cancer Research; Clinical Cancer Research; Current Biology, Journal of Cell Biology; Journal of Cell Science; Journal of Investigative Dermatology; Molecular Biology of the Cell; Molecular Cancer Therapeutics; Molecular and Cellular Biology; Oncogene; Pigment Cell Research, PLoS One.

### Grant Reviewer

NIH

June 2009: *Ad hoc* NIH Tumor Cell Biology (TCB)

June 2009: Special Emphasis Panel/Scientific Review Group 2009/10 ZRG1 OBT-A  
July 2009: NIH RFA OD-09-003 Challenge Grants Panel 6  
Oct 2009: NIH/NCI Discovery and Development P01 SEP  
Feb 2010: NIH/HLBP P01  
June 2010: NIH/NCI SPORE in Skin and Prostate Cancers  
Feb 2011: NCI SPORE in Prostate, Skin and Pancreatic and GI Cancers  
June 2011: *Ad hoc* NIH Tumor Microenvironment (TME) study section  
Sept 2011: NCI SPORE in Childhood ALL, Skin, Brain, Lung and GI Cancers  
Feb 2012: Discussion Leader, NCI SPORE in Breast, Endometrial, and Skin Cancers P50 SEP  
July 2012 - present: Charter member of Tumor Microenvironment (TME)  
Feb 2013: Discussion Leader, NCI SPORE in Skin and Prostate Cancers P50 SEP

ACS Jan 2008-2010: *Ad hoc* ACS, Cell structure and metastasis committee  
Jan 2011-present: Permanent member of Cell structure and metastasis committee  
Jan 2013-present: Vice Chair of Cell structure and metastasis committee

Other *Ad Hoc* for Melanoma research foundation (MRF), Association for International Cancer Research, National Science Foundation, Austrian Science Fund (FWF), British Skin Foundation, Dutch Cancer Society, European Research Council, Israel Science Foundation, Louisiana Board of Regents Research Competitiveness Subprogram. The Wellcome Trust.

**Memberships**

American Association for Cancer Research  
American Society for Cell Biology  
PanAmerican Society for Pigment Cell Research  
Society for Melanoma Research