

## CURRICULUM VITAE

Sep, 2009

### David Mu

Associate Professor

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### Education

- B.S. in Chemistry  
5/1987 ~ 8/1988      **Undergraduate student, Prof. Rai-Shung Liu's laboratory**, Department of Chemistry, National Tsing Hua University, Hsinchu, Taiwan, ROC. Research activity focuses on the synthesis and NMR characterizations of organometallic compounds.
- Ph.D. in Chemistry  
9/1988 ~ 12/1993      **Graduate Student, Prof. Judith P. Klinman's laboratory**, Department of Chemistry, University of California at Berkeley. Research activity focuses on the protein biochemistry and enzymology of novel enzyme cofactor – topa quinone – and the enzymes that contain topa quinone.
- Postdoctoral  
Research  
1/1994 ~ 3/1998      **Damon Runyon-Walter Winchell Postdoctoral Fellow, Prof. Aziz Sancar's group**, Department of Biochemistry, School of Medicine, University of North Carolina at Chapel Hill. Research activity focuses on the mechanistic study of human DNA excision repair activity that removes DNA adducts.

### Employment

- 6/1998~9/2004      Scientist. The Genomics Division, Tularik Inc/Amgen (Tularik Inc was acquired by Amgen in Aug/2004). Research activity focuses on the discovery and characterization of oncogenes activated by gene amplification.
- 10/2004~6/2008      Research Investigator and Faculty. Cancer Genome Center, Cold Spring Harbor Laboratory, NY.  
7/2008 ~      Associate Professor. Department of Pathology, College of Medicine, Pennsylvania State University.  
11/2008 ~      Joint faculty of Department of Biochemistry and Molecular Biology, College of Medicine, Pennsylvania State University.

### Awards

- 1986, 1987      Outstanding Undergraduate Student, National Tsing Hua University, Hsinchu, Taiwan, R.O.C. (graduated with top one honor in a class of 42).
- 1992      Outstanding Graduate Student Instructor, University of California at Berkeley. (Chem 1B of Fall, 1991).
- 8/1994~6/1997      Postdoctoral Fellowship Award from the Cancer Research Fund of the Damon Runyon-Walter Winchell Foundation, New York, New York.

### Memberships

- American Association for the Advancement of Science (AAAS)  
American Association for Cancer Research (AACR)  
American Society for Investigative Pathology (ASIP)

### Editorial Services

**Ad-hoc reviewer for various journals:** 2006 ~ present

*American Journal of Pathology, Chemical Research in Toxicology, Disease Models and Mechanisms, Proc. Natl. Acad. Sci. USA.*

**Reviewer of research grant applications:** 2007 ~ present

- New York University internal research seed grants (9/2008 ~ 8/2009).
- Clinician Scientist Fellowship grant applications of Cancer Research UK (12/2008)

- Subject matter expert reviewer, NIH Study Section (2009/10 ZRG1 OBT-A (58) R) reviewing Challenge Grants submitted under the American Recovery and Reinvestment Act of 2009 (5/2009).
- Scientific Review Committee, Penn State Univ. College of Medicine (5/2009 ~ ).
- NCI/NIH Study Section Member (OTC-L B) reviewing SBIR/STTR grant applications (5/2009 ~ ).
- Peer review panel of the Lung Cancer Research Program (LCRP) for the Department of Defense (DoD) Congressionally Directed Medical Research Programs (CDMRP) (9/2009 ~ ).

## Teaching and Service

### Classroom teaching:

- 2008 ~ Lecturer of the Genomics course at Penn State University at University Park.  
2009 ~ Biology of Neoplasia (PATH520) and Biological Basis of Disease (BBD716), PSU College of Medicine.

### Other:

- 8/2008 ~ Pathology departmental contact person to work with the representative of George T. Harrell Library of PSU Hershey.  
9/2008 ~ Faculty interviewer of Penn State Univ. medical student candidates.  
10/2008 ~ Scientific member of the Experimental Therapeutics division, Penn State Cancer Institute.  
11/2008 ~ Appointed a member of the Graduate School Faculty of Penn State University.  
12/2008 ~ Faculty member of the Penn State Pathology Residency Program Committee which oversees the residency program.  
12/2008 ~ Faculty member of the Cell and Molecular Biology graduate program of Penn State University College of Medicine.  
12/2008 ~ The Educational committee, Penn State University Cancer Institute.  
12/2008 ~ Member of the PSU Pathology Peer Review committee.  
1/2009 ~ Faculty member of Penn State Intercollege Graduate Programs of Genetics and Molecular Medicine.  
1/2009 Served on the Panel to discuss Identification and validation of novel cancer targets at the retreat of Experimental Therapeutics Program of PSU Cancer Institute.  
2/2009 Served on the Genome Expert Panel at PSU following the lecture of Dr. Alan Gutmacher, acting director of NHGRI to respond to questions and comments from the audience.  
2/2009 ~ Faculty interviewer of candidate graduate students of four PSU graduate programs (Genetics, Molecular Medicine, Cell and Molecular Biology, and Biochemistry).  
9/2009 ~ Faculty member of Penn State Intercollege Graduate Programs in Bioinformatics and Genomics.

### Research Training and Laboratory Instruction:

#### Graduate Students:

- 10/2008 ~ Ji Qi, Department of Biochemistry and Molecular Biology at PSU College of Medicine.  
12/2008 ~ Tina Sharp, the Cell and Molecular Biology graduate program, PSU College of Medicine.

#### Other Graduate Student Thesis Committee Involvement at Penn State University:

- 2008 ~ Steven Wentzel (Keith Cheng, Thesis Advisor).  
2009 ~ Erin Walsh (Timothy Ritty, Thesis Advisor); Lindsay Horvath (Laura Carrel, Thesis Advisor), Beverly Baptiste (Kristin Eckert, Thesis Advisor).

#### Lab Technicians and others supervised:

- 2008 ~ Shaw Rice (M.S., Millersville University).  
2009 Jenna Craig, Joel Coble (Summer research interns).

## Accepted Speaking Engagements

- 3/1996 "Mechanistic Study of Human DNA Excision Repair Nuclease". Keystone symposium, Taos, NM.  
4/1997 "Molecular Mechanism of Human DNA Excision Repair Nuclease". Keystone symposium, Taos, NM.  
7/2/2004 "Discovery and characterization of amplified human oncogenes". Oncology group, Merck & Co., West Point, PA.  
2/1/2006 "Cancer and Genes". Science Honor Society. East Meadow High School. East Meadow, NY.  
5/11/2007 "Discovery and characterization of amplified human cancer genes". Nelson Institute of Environmental Medicine, New York University, Tuxedo, NY.  
11/27/2007 "Novel Lung Cancer Genes and Clinical Implications". Department of Pathology, Penn State University College of Medicine, Hershey, PA.

- 12/3/2007 "Discovery and characterization of 14q13 human lung oncogenes". Cold Spring Harbor Laboratory, NY.
- 12/18/2007 "Discovery and characterization of amplified human cancer genes". Nelson Institute of Environmental Medicine, New York University, Tuxedo, NY.
- 1/23/2008 "Novel Lung Cancer Genes and Clinical Implications". Department of Thoracic Surgery, Weill Cornell Medical College, Cornell University, New York, NY.
- 2/21/2008 "Novel Lung Cancer Genes and Clinical Implications". Department of Human Genetics, University of Michigan, Ann Arbor, MI.
- 3/26/2008 "Discovery and characterization of amplified human cancer genes". School of Medicine, New York University, New York, NY.
- 9/8/2008 Departmental seminar, Department of Pharmacology, Penn State University College of Medicine. Hershey, PA. Seminar title: Novel lung oncogenes and clinical implications".
- 9/8/2008 Departmental seminar, Department of Biochemistry and Molecular Biology, Penn State University College of Medicine. Hershey, PA. Seminar title: Novel lung oncogenes and clinical implications".
- 11/12/2008 Biology Colloquium. Department of Biology, Millersville University. Millersville, PA. "Introduction to Cancer Genomics".
- 1/15/2009 Departmental seminar, Department of Microbiology and Immunology, Penn State University College of Medicine. Hershey, PA. Seminar title: Novel lung oncogenes and clinical implications".
- 4/16/2009 Keynote speaker, 2009 Genetics Symposium, Penn State College of Medicine 2009. "From Basic to Translational Lung Cancer Research".
- 10/2/2009 Departmental seminar, Department of Cellular and Molecular Physiology, Penn State University College of Medicine. Hershey, PA. Seminar title: "Oncogenic lung developmental factors".

### Publications (peer-reviewed)

- Gene-Hsiang Lee, Shie-Ming Peng, Shie-Fu Lush, David Mu, Rai-Shung Liu. "Reaction of iron-.eta.1-dienyl complexes with dienophiles. X-ray structures of the [4 + 2] cycloaddition adducts". **Organometallics** 1988; 7:1155-1161.
- Fu-Chen Liu, David Mu, Gene-Hsian Lee, Shie-Ming Peng, and Rai-Shung Liu. "Preparation of Molybdenum- $\eta^3$ -Pentadienyl Complexes: Structural Characterization of a Delocalized Pentadienyl Ligand in Anti- $\eta^3$  Geometry" **Organometallics** 1989;8:402-407.
- Inn-Chu Tsing, David Mu, Gene-Hsian Lee, Shie-Ming Peng, and Rai-Shung Liu. "Preparation and Properties of Molybdenum-Pentadienyl Complexes: A Facile  $\eta^5 \rightleftharpoons \eta^3$  Reversible Interconversion for a Pentadienyl Ligands" **Organometallics** 1989;8:2248-2252.
- Susan Janes, David Mu, David Wemmer, Alan J. Smith, Surinder Kaur, David Maltby, Alma L. Burlingame, and Judith P. Klinman. "A New Redox Cofactor in Eukaryotic Enzyme: 6-Hydroxydopa at the Active Site of Bovine Serum Amine Oxidase" **Science** 1990;248:981-987.
- Doreen E. Brown, Michele A. McGuirl, David M. Dooley, Susan M. Janes, David Mu, and Judith P. Klinman. "The Organic Functional Group in Copper-containing Amine Oxidases: Resonance Raman spectra are consistent with the presence of topa quinone in the active site" **Journal of Biological Chemistry**. 1991;266:4049-4051.
- David Mu, Susan M. Janes, Alan J. Smith, Doreen E. Brown, David M. Dooley, and Judith P. Klinman. "Tyrosine Codon Corresponds to Topa Quinone at the Active Site of Copper Amine Oxidases" **Journal of Biological Chemistry**. 1992;267:7979-7982.
- David Mu, Katalin F. Medzihradzky, Greg Adams, Alan J. Smith, Alma L. Burlingame, Danying Cai, & Judith P. Klinman "Primary Structures for Mammalian Intracellular and Serum Copper Amine Oxidases" **Journal of Biological Chemistry**. 1994;269:9926-9932.
- David Mu, Elisabeth Bertrand-Burggraf, Juch-Chin Huang, Robert P.P. Fuchs, & Aziz Sancar. "Human and E.coli Excinucleases Are Affected Differently by the Sequence Context of Acetylaminofluorene-guanine Adduct" **Nucleic Acids Research** 1994;22:4869-4871.
- Chi-Hyun Park, David Mu, Joyce T. Reardon, & Aziz Sancar. "The General Transcription Repair Factor TFIIH is Recruited to the Excision Repair Complex by the XPA Protein Independent of the TFIIIE Transcription Factor" **Journal of Biological Chemistry**. 1995;270:4896-4902.
- David Mu, Chi-Hyun Park, Tsukasa Matsunaga, David S. Hsu, Joyce T. Reardon, & Aziz Sancar. "Reconstitution of Human DNA Repair Excision Nuclease in a Highly Defined System" **Journal of Biological Chemistry**. 1995; 270:2415-2418.
- Tsukasa Matsunaga, David Mu, Chi-Hyun Park, Joyce Reardon, & Aziz Sancar "Analysis of the Roles of the Subunits Involved in Dual Incisions by Using Anti-XPG and Anti-ERCC1 Antibodies" **Journal of Biological Chemistry**. 1995;270:20862-20869.
- Aleksey Kazantsev, David Mu, Anne F. Nichols, Stuart M. Linn, and Aziz Sancar. "Functional Complementation of Xeroderma pigmentosum Group E by Replication Protein A (RPA) in an in vitro System" **Proc. Natl. Acad. Sci. USA** 1996;93:5014-5018.

13. David Mu, David S. Hsu, and Aziz Sancar. "Reaction Mechanism of Human DNA Repair Excision Nuclease" **Journal of Biological Chemistry**. 1996;271:8285-8294.
14. Tsukasa Matsunaga, Chi-Hyun Park, Tadayoshi Bessho, David Mu, and Aziz Sancar. "The Replication Protein RPA Confers Structure-Specific Endonuclease Activities to the XPF-ERCC1 And XPG Subunits of Human DNA Repair Excision Nuclease" **Journal of Biological Chemistry**. 1996;271:11047-11050.
15. Joyce T. Reardon, David Mu & Aziz Sancar "Overproduction, Purification, and Characterization of the XPC Subunit of the Human DNA Repair Excision Nuclease" **Journal of Biological Chemistry**. 1996;271:19451-19456.
16. Deborah B. Zamble, David Mu, Joyce T. Reardon, Aziz Sancar, & Stephen J. Lippard "Repair of Cisplatin-DNA Adducts by the Mammalian Excision Nuclease" **Biochemistry** 1996;35:10004-10013.
17. David Mu, Mihray Tursun, Derek R. Duckett, James T. Drummond, Paul Modrich, & Aziz Sancar "Recognition and Repair of Compound DNA Lesions (Base Damage and Mismatch) by Human Excision Repair and Mismatch Repair Systems" **Molecular and Cellular Biology** 1997;17:760-769.
18. David Mu and Aziz Sancar "Model for XPC-Independent Transcription-Coupled Repair of Pyrimidine dimers in Humans" **Journal of Biological Chemistry**. 1997;272:7570-7573.
19. Tadayoshi Bessho, David Mu, and Aziz Sancar "Initiation of DNA Interstrand Crosslink Repair in Humans: The Nucleotide Excision Repair System Makes Dual Incisions 5' to the Crosslinked Base and Removes a 22-28 Nucleotide-long Damage-free strand" **Molecular and Cellular Biology** 1997;17:6822-6830.
20. David Mu, Mitsuo Wakasugi, David S. Hsu, and Aziz Sancar "Characterization of Reaction Intermediates of Human DNA Excision Repair Nuclease" **Journal of Biological Chemistry**. 1997;272:28971-28979
21. David Mu, Tadayoshi Bessho, Lubomir V. Nechev, David J. Chen, Thomas M. Harris, John E. Hearst, and Aziz Sancar. "DNA Interstrand Cross-Links Induce Futile Repair Synthesis in Mammalian Cell Extracts" **Molecular and Cellular Biology** 2000;20:2446-2454.
22. David Mu, Liyun Chen, Xiping Zhang, Lei-Hoon See, Christina M. Koch, Clifford Yen, James Jiayuan Tong, Lori Spiegel, Ken C. Q. Nguyen, Allyson Servoss, Yue Peng, Lin Pei, Jeffrey R. Marks, Scott Lowe, Timothy Hoey, Lily Yeh Jan, W. Richard McCombie, Michael H. Wigler & Scott Powers "Genomic amplification and oncogenic properties of the *KCNK9* potassium channel gene" **Cancer Cell** 2003;3:297-302.
23. Lin Pei, Ofer Wiser, Anthony Slavin, David Mu, Scott Powers, Lily Yeh Jan, and Timothy Hoey. "Oncogenic potential of TASK3 (Kcnk9) depends on K<sup>+</sup> channel function" **Proc. Natl. Acad. Sci.** 2003;100:7803-7807.
24. Lin He, J. Michael Thomson, Michael T. Hemann, Eva Hernando-Monge, David Mu, Summer Goodson, Scott Powers, Carlos Cordon-Cardo, Scott W. Lowe, Gregory J. Hannon, and Scott M. Hammond. A microRNA Polycistron as a Potential Human Oncogene. **Nature**, 2005;435:828-833.
25. E Galteland, E A Sivertsen, D H Svendsrud, L Smedshammer, S H Kresse, L A Meza-Zepeda, O Myklebost, Z Suo, D Mu, P M DeAngelis and T Stokke. Translocation t(14;18) and gain of chromosome 18/BCL2: effects on BCL2 expression and apoptosis in B-cell non-Hodgkin's lymphomas. **Leukemia** 2005;19:2313-2323.
26. E A Sivertsen, E Galteland, D Mu, H Holte, L Meza-Zepeda, O Myklebost, S Patzke, E B Smeland and T Stokke. Gain of chromosome 6p is an infrequent cause of increased PIM1 expression in B-cell non-Hodgkin's lymphomas. **Leukemia** 2006;20:539-542.
27. Lars Zender, Mona S. Spector, Wen Xue, Peer Flemming, Carlos Cordon-Cardo, John Silke, Sheung-Tat Fan, John M. Luk, Michael Wigler, Gregory J. Hannon, David Mu, Robert Lucito, Scott Powers, and Scott W. Lowe. Identification and Validation of Oncogenes in Liver Cancer Using an Integrative Oncogenomic Approach. **Cell** 2006;125:1253-1267.
28. Aaron M. Geurts, Lara S. Collier, Jennifer L. Geurts, Leann L. Oseth, Matthew L. Bell, David Mu, Robert Lucito, Susan A. Godbout, Laura E. Green, Scott W. Lowe, Betsy A. Hirsch, Leslie A. Leinwand, David A. Largaespada. Gene Mutations and Genomic Rearrangements in the Mouse as a Result of Transposon Mobilization from Chromosomal Concatemers. **PLoS Genetics**. 2006; Vol. 2, No. 9, e156 doi:10.1371.
29. Robert J. Pelham, Linda Rodgers, Ira Hall, Robert Lucito, Ken C. Q. Nguyen, Nicholas Navin, James Hicks, David Mu, Scott Powers, Michael Wigler, and David Botstein. Identification of alterations in DNA copy number in host stromal cells during tumor progression. **Proc. Natl. Acad. Sci. USA** 2006;103:19848-19853.
30. David MacPherson, Karina Conkrite, Mandy Tam, Shizuo Mukai, David Mu, and Tyler Jacks. Murine bilateral retinoblastoma exhibiting rapid onset, metastatic progression and N-myc gene amplification. **EMBO J** 2007;26:784-794.
31. R. Karni, E. de Stanchina, S.W. Lowe, R. Sinha, D. Mu, and A.R. Krainer. The splicing factor SF2/ASF is an oncogene. **Nature Struct. Mol. Biol.** 2007;14:185-193.
32. C.L. Scott, J. Gil, E. Hernando, J. Teruya-Feldstein, M. Narita, D. Martinez, T. Visakorpi, D. Mu, C. Cordon-Cardo, G. Peters, D. Beach, and S.W. Lowe. Oncogenic properties of the polycomb protein CBX7. **Proc. Natl. Acad. Sci. USA** 2007;104:5389-5394.
33. Jude Kendall, Qing Liu, Amy Bakleh, Alex Krasnitz, Ken Nguyen, B. Lakshmi, William Gerald, Scott Powers, & David Mu. Oncogenic cooperation and co-amplification of developmental transcription factor genes in lung cancer. **Proc. Natl. Acad. Sci. USA** 2007;104:16663-16668.

34. Jiangyong Miao, David Mu, Burce Ergel, Rajasekhar Singavarapu, Zhenfeng Duan, Scott Powers, Esther Oliva, Sandra Orsulic. Hepsin colocalizes with desmosomes and induces progression of ovarian cancer in a mouse model. **Int. J. Cancer**. 2008;123:2041-7.
35. Navneet Sangha, Rong Wu, Rork Kuick, Scott Powers, David Mu, Diane Fiander, Kit Yuen, Hidetaka Katabuchi, Hironori Tashiro, Eric R. Fearon, and Kathleen R. Cho. Neurofibromin 1 (NF1) Defects are Common in Human Ovarian Serous Carcinomas and Co-Occur with TP53 Mutations. **Neoplasia** 2008;10:1362-72.
36. David S. Hsu, Chaitanya R. Acharya, Bala S. Balakumaran, Richard F. Riedel, Mickey K. Kim, Marvaretta Stevenson, Sascha Tuchman, Sayan Mukherjee, William Barry, Holly K. Dressman, Joseph R. Nevins, Scott Powers, David Mu, and Anil Potti (**D.M. & A.P.**, equal senior authorship) Characterizing the Clinical Relevance of Developmental Pathways in Lung Cancer. **Proc. Natl. Acad. Sci. USA** 2009; 106:5312-5317.

### Review Articles and Book Chapters

1. Judith P. Klinman & David Mu. Quinonozymes in Biology. **Annual Review of Biochemistry** 1994;63:299-344.
2. David Mu and Judith P. Klinman. Cloning of Mammalian Topa Quinone-Containing Enzymes. **Methods in Enzymology** 1995;258, 114-122.
3. David Mu & Aziz Sancar. DNA Excision Repair Assays. **Progress in Nucleic Acid Research and Molecular Biology** 1997;56:63-81.
4. Xiaodong Zhao and David Mu. (6-4) Photolyase: light-dependent repair of DNA damage. **Histology and Histopathology** 1998;13:1179-1182.
5. Scott Powers & David Mu. Genetic Similarities Between Organogenesis and Tumorigenesis of the Lung. **Cell Cycle** 2008;7:200-204.

### Patent Applications

1. "Amplification and Overexpression of Oncogenes" 2003. International Pub. NO. WO 03/100000 A2.
2. "Amplified Cancer Gene Hepsin" (2002) US serial NO. 10/073,060 (European Patent Office: application number 02706233.0-2402-US0204018). Pub. NO. US 2003/0049645 A1.
3. "Gene Amplification in Cancer". US Provisional Application No. 10/742,442 (2003).
4. "Amplified Oncogenes and Their Involvement in Cancer". Patent Cooperation Treaty International Publication Number WO 03/018770 A2 (2003). Pub. NO. US 2003/0092042 A1.
5. "Gene Amplification and Overexpression in Cancer (SALPR)" US Provisional Application No. 60/479,833 (2003).

### Patents Granted

1. "Diagnosis and treatment of cancer using mammalian pellino polypeptides and polynucleotides". United States Patent # 7,115,368, issued Oct-3-2006.
2. "Nucleic acid encoding KCNB potassium channel". United States Patent # 7,462,465, issued Dec-9-2008.

### Research Funding Support

#### Active (or approved) -

1R01CA127547-01 (PI: Mu) 9/8/2008 – 7/31/2013  
 NCI, NIH

Identification and characterization of driver gene(s) in recurrent lung cancer amplicons.

The major goals of this project are the discovery and characterization of novel amplified lung oncogenes at the 14q13 locus and the development of a functional tool to rapidly identify the driver gene(s) of a multigenic amplicon.

Role: PI

Individual Dean's Feasibility Grant, PSUCOM (PI: Mu) 7/1/2009 – 6/30/2010

Discovery and characterization of novel lung cancer genes at 8p11.21

The major goals of this project are the discovery and characterization of novel amplified lung oncogenes at the 8p11.21 locus.

Role: PI

Uniting Against Lung Cancer, New York. (PI: Mu) 6/1/2009 – 12/31/2009

Characterization of microRNA-dependent regulation of the amplified and cooperating lung oncogenes at 14q13.3.

The major goals of this project are the discovery and characterization of the microRNAs that regulate TTF1, NKX2-8, and PAX9.

Role: PI

3R01CA127547-01A1S1 (PI: Mu) 6/1/2009 – 8/31/2011

NCI, NIH (funded by the Recovery Act)

Supplement to "Identification and characterization of driver gene(s) in recurrent lung cancer amplicons"

To hire two summer undergraduate research interns to explore the expression patterns of the 14q13.3 amplified lung oncogenes in archival tissues.

Role: PI

**Pending –**

W.W. Smith Charitable Trust

(PI: Mu)

9/1/2009 – 8/31/2011

Functional impact of genetic variance of an amplified lung oncogene

The major goals of this project are the functional analysis of natural genetic variants of the PAX9 oncogene.

Role: PI

**Completed –**

W81XWH-07-1-0495

(PI: Mu)

7/1/2007 – 7/1/2008

CDMARP, DOD

Testing the oncogenic relevance of cell adhesion and cytoskeletal genes affected by DNA deletions in breast cancer.

The major role of this project is the functional validation potential novel tumor suppressor genes.

Role: PI (Relinquished upon PI's departure of host institution)

(PI: Mu)

10/1/2005 – 9/30/2007

Joan's Legacy Research Foundation, New York, New York.

Discovery and characterization of novel amplified lung cancer genes in women.

The major role of this project is the discovery of female-prone gene amplification events in human lung cancer.

Role: PI