

## CURRICULUM VITAE

NAME: Phouthone Keohavong  
 BUSINESS ADDRESS: University of Pittsburgh, Graduate School of Public Health  
 Department of Environmental and Occupational Health  
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## EDUCATION AND TRAINING

### Undergraduate

<u>1974-1976</u>	Louis Pasteur University Strasbourg, France	Diploma of General Studies Nature and Life Sciences
<u>1976-1977</u>	Louis Pasteur University Strasbourg, France	Bachelor of Sciences Structural and Metabolic Chemistry and Organic Chemistry
<u>1977-1978</u>	Louis Pasteur University Strasbourg, France	Master's Degree Microbiology, Physic-Chemistry, and Molecular Biology.
<u>1978-1979</u>	Louis Pasteur University Strasbourg, France	Diploma of Advanced Study Biochemistry and Molecular Biology.

### Graduate

<u>1979-1982</u>	Louis Pasteur University Strasbourg, France	University Doctorate Biochemistry and Molecular Biology
<u>1982-1986</u>	Louis Pasteur University Strasbourg, France	Doctorate of Sciences Biochemistry and Molecular Biology

**Post Graduate**

1986-1988                      Massachusetts Institute of                      Postdoctoral Researcher  
 Technology, Cambridge                      Molecular Toxicology  
 MA 02139  
 Supervisor: Professor William G. Thilly  
 Biological Engineering, Massachusetts Institute of Technology,  
 Cambridge, MA 02139

**APPOINTMENTS AND POSITIONS****Academic**

July 2001 – Present                      University of Pittsburgh                      Associate Professor  
 Department of Environmental and  
 Occupational Health,  
 University of Pittsburgh,  
 130 DeSoto Street, Pittsburgh, PA 15261  
 Tel: (412) 624-8881

Department Chairman: Professor Sally Wenzel

October, 1991 – June 2001                      University of Pittsburgh                      Assistant Professor  
 Department of Environmental and  
 Occupational Health,  
 University of Pittsburgh,  
 100 Technology Drive, Pittsburgh, PA 15219  
 Tel: (412) 624-8881

**Non-Academic**

1988-1991                      Center for Environmental Health                      Research Scientist  
 Sciences, Massachusetts Institute  
 of Technology, Cambridge, MA 02139.

Biological Engineering, Massachusetts Institute of Technology,  
 21 Ames Street Building 16, Room 771,  
 Cambridge, MA 02139

## MEMBERSHIP IN PROFESSIONAL AND SCIENTIFIC SOCIETIES

1987 - Present	Environmental Mutagen Society
1995 - Present	American Association for Cancer Research
1997 - Present	Society of Toxicology

## PROFESSIONAL ACTIVITIES

### 1. Teaching

#### a. Courses Taught

Number	Title	Hours of Lecture	Credits
EOH 2371	Cellular and Molecular Toxicology (until 2006)	2 hrs/week	2 credits
EOH 2303 (Lab. Class)	Applications of Molecular Methods to Toxicology (until 2001)	2 hrs/week	2 credits

#### b. Other Teaching: Spring term

*2015*

Molecular Fundamentals, course EOH 2310 (Fall) Cell Cycle Control and Cancer – Student presentation.

*2012*

Molecular Fundamentals, course EOH 2310 (Fall) Cell Cycle Control and Cancer – Student presentation.

*2011*

Molecular Fundamentals, course EOH 2310 (Spring) Cell Cycle Control and Apoptosis – Student presentation.

*1994*

Molecular and Cellular Toxicology, course EOH 2171, Title "In vitro mutation assays", lecture for graduate students of the Department of Environmental and Occupational Health, Graduate School of Public Health, University of Pittsburgh.

Mutation and Mammalian Chromosomes, course HuGen 2030, "In vitro mutation assays and cytogenetic and epigenetic assays", lecture for graduate students of the Department of Human Genetics, University of Pittsburgh.

*1993*

Mutation and Mammalian Chromosomes, course HuGen 2030, "In vitro mutation assays and cytogenetic and epigenetic assays", lecture for graduate students of the Department of Human Genetics, University of Pittsburgh.

*1991*

The Fate and Transport of Environmental Agents, course number EOH 2122 " Transport and exposure pathway analysis of environmental agents", lecture for graduate students of the Department of Environmental and Occupational Health, University of Pittsburgh.

Group leader discussions for first year medical students at the School of Medicine:

Thalidomide and Birth defects: Case report. September 26, 1996.

Thalidomide and Birth defects: Case report. September 26, 1995

Diagnostic tests for venereal diseases. September 16, 1993

Does occupational exposure to formaldehyde increase the risk of nasopharyngeal cancer? January 7 and 14, 1993

**c. Graduate Student Essays, Theses, and Dissertations**

Robert Gealy, graduate student, M.S. Thesis defended in June of 1998.

Weimin GAO, graduate student, Ph.D. thesis title: "Oncogene mutations and DNA repair genes as biomarkers for lung cancer: defended in July of 2003.

**d. Service on Masters or Doctoral committees**

Department of Environmental and Occupational Health, Graduate School of Public Health, University of Pittsburgh:

Hanxian Huang, Ph.D. Thesis title: "Effects of low dose gamma rays on DNA excision

repair in E. coli", defended in May of 1993.

Herng-Der Chern, University of Pittsburgh Medical Center. Thesis title: "Environmental Hypothesis of Bladder Carcinogenesis ", defended in December of 1994.

Beatriz Zayas, Ph.D. thesis title: "Cytotoxicity and Mutagenicity of 4-aminobiphenyl/metabolites", defended in July 16 of 1998.

Cheri White, M.S. thesis title: " Pharmacogenetics: Role in lung and head and neck cancer susceptibilities ", defended in December of 1995.

Judy Facey, thesis title: "Metabolism and genotoxicity of tamoxifen ", defended in April of 1998.

Nina Joshi, Ph.D. thesis title: "Mutagenicity and genetic instability in breast and endometrial cell lines", defended on March 6 of 2002.

Heather Gordich. Ph.D. thesis title: "Maternal genetic factors/exposures and somatic mutations in the GPA locus in mothers and newborns as biomarkers in Prenatal Exposure and Preeclampsia Prevention (PEPP)", defended on April 15 of 2002.

Susanna Delano, Ph.D. thesis title: "High-resolution genotyping of Clostridium botulinum strains using amplified fragment length polymorphism (AFLP) analysis", defended on April 23, 2002.

Tomoko Nukiu, Ph.D. thesis title: "Metabolizing enzymes and somatic mutations in peripheral blood lymphocytes of newborns and mothers as biomarkers of maternal exposure to tobacco smoke during pregnancy", defended on July 25, 2002.

Sutira Lerdragoon, Ph.D. thesis: "Gentic susceptibilities in lung cancer", defended on September 16, 2002.

Rubina Das. M.S., defended on May 21, 2002.

e. Supervision of Post-Doctoral Students, Residents, and Fellows:

<b>Name</b>	<b>Position</b>	<b>Dates Supervised</b>
Dharambir Sandhu	Post-doctoral Fellow	3/1992 to 3/ 1993
Rajiv Shukla	Post-doctoral Fellow	3/1992 to 6/1994
Hanxian Huang	Post-doctoral Fellow	6/1993 to 6/ 1994
Dan Zhu	Post-doctoral Fellow	11/1994 to 10/1996,
Lifang Zhang	Post-doctoral Fellow	2/1997 to 7/1999
Guoying Yu	Post-doctoral Fellow	6/2001 to 12/2002
Kui-Cheng Zheng	Visiting Scientist	9/2002 to 4/2003

Yang Liu	Post-doctoral Fellow	6/2004 to 7/2006
Jide Jin	Post-doctoral Fellow	8/2006 – 11/2008

## **2. Research and Training**

### **a. Grants and Contracts**

<b>Years Inclusive</b>	<b>Grant Number and Title</b>	<b>Source</b>	<b>Annual Direct Cost</b>
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#### **Submitted:**

6-16-2017	R21 SPLUNC1 and inflammation-associated lung cancer To test the hypothesis that SPLUNC1 modulated E2 signaling in suppressing lung tumorigenesis	NIH/NCI	\$137,500
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#### **Completed:**

01/01/09 – 12/31/11	1 R21 CA129260-01A2 K-ras mutations in bronchiolar stem cells as biomarkers for lung cancer Principal Investigator	NIH/NCI	\$150,000
6/1/08 – 5/30/09	Assessment of mutagenicity of carbonaceous nano-materials (Shvedova) Co-investigator	NIOSH/CDC	\$50,000
1/1/04 – 12/31/2008	RSG-99-161-04-CNE K-ras and p53 mutations in bronchoscopy specimens as biomarkers for lung cancer Principal Investigator	American Cancer Society	\$175,500
7/1/99 – 6/30/2003	RPG-99-161-01-CNE K-ras and p53 mutations as biomarkers for lung cancer Principal Investigator	American Cancer Society	\$93,000
7/1/2001 – 6/30/2005	1RO1 CA59834-06 (Branch) Drug metabolizing enzymes as risk factors in bladder cancer Co-Investigator	NIH	\$212,955
7/1/2001 – 6/30/2005	1RO1CA672610-01(Yalowich)	NIH	\$250,000

Mechanisms and prevention of  
etoposide-induced leukemia  
Co-Investigator

### **b. Invited Lectureships and Major Seminars related to Your Research**

Plenary lecture on “K-ras mutations in histologically-normal tissue adjacent to lung carcinoma”. The 5<sup>th</sup> International Symposium on Predictive Oncology and Therapy, Geneva, Switzerland, October 28 – November 1, 2000.

Service as a Chairperson in a symposium on “Molecular Genetics Markers”, at the 5<sup>th</sup> International Symposium on Predictive Oncology and Therapy, Geneva, Switzerland, October 28 – November 1, 2000.

### **c. Other Research and Training Activities**

Co-editor of Protocols Book:

Keohavong, P., and Grant S.G. (co-eds) (2004). Protocols in Molecular Toxicology, Humana Press, Totowa, New Jersey. *Methods in Molecular Biology*.

Keohavong, P., and Grant S.G. (co-eds) (2014). Second Edition, Protocols in Molecular Toxicology, Springer/Humana Press, Totowa, New Jersey. *Methods in Molecular Biology*.

## **PUBLICATIONS**

### **1. Refereed Articles**

Keohavong P., Lan Q, Gao W. (2018) p53 and K-ras mutations in lung tissues and sputum samples of individuals exposed to smoky coal emissions in Xuan Wei County, China. *Mutat. Res.*, 829-830: 70-74

Gao W, Zhu D, Keohavong P (2017). Sequence-dependent cleavage of mismatched DNA by Ban I restriction endonuclease. *J Mol Recognit.*, Oct; 30 (10).

Gao W., Jin, J., Yin, J., Land S., Gaither-Davis, A, Christie, N., Luketich, J.D., Siegfried, J., Keohavong, P. (2017) KRAS and TP53 mutations in bronchoscopy samples from former lung cancer patients. *Mol. Carcinogenesis*. 56: 381-388.

Gao W, Lu C, Chen L, Keohavong P. Overexpression of CRM1 (2015): A Characteristic Feature in a Transformed Phenotype of Lung Carcinogenesis and a Molecular Target for Lung Cancer Adjuvant Therapy. *J Thorac Oncol*. 10: 815-825.

Shvedova AA, Yanamala N, Kisin ER, Tkach AV, Murray AR, Hubbs A, Chirila MM, Keohavong P, Sycheva LP, Kagan VE, Castranova V. (2014) Long-term effects of carbon containing engineered nanomaterials and asbestos in the lung: one year postexposure comparisons. *Am J Physiol Lung Cell Mol Physiol.* **306**: L170-182.

Gao W. and Keohavong P. (2014) Detection of point mutations of K-ras oncogene and p53 tumor suppressor gene in sputum samples. *Methods in Molecular Biology*, 1105: 325-344.

Stabile, L.P., Rothstein M.E., Lenzner, D., Land, S.R., Dacic, S., Keohavong, P. and Siegfried, S.M (2012) Prevention of Tobacco Carcinogen-Induced Lung Cancer in Female Mice Using Anti-Estrogens. *Carcinogenesis*, **33**: 2181-2189.

Keohavong, P., Kahkonen, B., Kinchington, E., Ying, J., Jin, J., Liu, X., Siegfried, J.M. and Di, Y.P. (2011). K-ras mutations in lung tumors from NNK-treated mice with lipopolysaccharide-elicited lung inflammation. *Anticancer Res.*, **31**: 2877-2882.

Stabile L.P., Rothstein M.E., Keohavong P., Lenzner D., Land S.R., Gaither-Davis A.L., Kim K.J., Kaminski N., Siegfried J.M. (2010) Targeting of Both the c-Met and EGFR Pathways Results in Additive Inhibition of Lung Tumorigenesis in Transgenic Mice. *Cancers.* **2**: 2153-2170.

Gao W, Mady HH, Melhem MF, and Keohavong P. (2009) Analysis of p53 mutations in histologically normal lung tissues and tumors from non-small cell lung cancer patients. *Mol. Carcinogenesis*, **48**: 633-641.

Shvedova AA, Kisin ER, Murray AR, Johnson VJ, Gorelik O, Arepalli S, Hubbs AF, Mercer RR, Keohavong P, Sussman N, Jin J, Yin J, Stone S, Chen BT, Deye G, Maynard A, Castranova V, Baron PA, Kagan VE. (2008) Inhalation versus aspiration of single walled carbon nanotubes in C57BL/6 mice: inflammation, fibrosis, oxidative stress and mutagenesis. *Am. J. Physiol. Lung Cell Mol. Physiol.*, **4**: L552-565.

Liu Y, Lan G, Shen S, Ren, X., Mumford J, Keohavong P. (2008) Aberrant promoter methylation of multiple genes in sputum from individuals exposed to smoky coal emission. *Anticancer Research*, **28**: 2061-2066.

Stabile L, Rothstein ME, Keohavong P, Jin J, Yin J, Land S, Dacic S, Luong TM, Kim KJ, Siegfried JM (2008). Therapeutic targeting of human hepatocyte growth factor with a single neutralizing monoclonal antibody reduces lung tumorigenesis. *Mol. Cancer Therapeut.* **7**: 1913-1922.

Liu Y, Gao, W-M., Siegfried JM, Weissfeld JL, Luketich JD, Keohavong P. (2007) Promoter methylation of RASSF1A and DAPK and mutations of K-ras, p53, and EGFR in lung tumors from Smokers and Never-smokers. *BMC Cancer*, **3**; **7**: 74.



Zhang W, Stabile LP, Keohavong P, Romkes M, Grandis JR, Schiller JH, Traynor AM, and Siegfried JM. (2006). Mutation and polymorphism in the EGFR-TK Domain associated with Lung Cancer. *J. Thoracic Oncology*. **1**: 635-647.

Gao WM, Romkes M, Siegfried JM, Luketich JD, Keohavong P. (2006) Polymorphisms in DNA repair genes XPD and XRCC1 and p53 mutations in lung carcinomas of never-smokers. *Mol Carcinog*. **45**: 828-832.

Zheng KC, Yalowich JC, Kagan VE, Keohavong P. (2006) Increased mutant frequencies in the HPRT gene locus of leukemia HL-60 cells treated with succinylacetone. *Cell Biol Toxicol*. **22**: 361-370.

Liu, Y., Lan, Q., Siegfried, J.M., Luketich, J.D., Keohavong, P. (2006) Aberrant promoter methylation of p16 and MGMT genes in lung tumors from smoking and never-smoking lung cancer patients. *Neoplasia*, **8**: 46-51.

Lan, Q., Shen, M., Berndt, S.I., Bonner, M.R., Heb, X., Yeager, M., Welch, R., Keohavong, P., Donahue, M., Hainaut, P. and Chanock, S. (2005). Smoky coal exposure, *NBS1* polymorphisms, p53 protein accumulation, and lung cancer risk in Xuan Wei, China. *Lung Cancer*, **49**: 317-323.

Keohavong P. Xi L. Day RD. Zhang L. Grant SG. Day BW. Ness RB. Bigbee WL. (2005) HPRT gene alterations in umbilical cord blood T-lymphocytes in newborns of mothers exposed to tobacco smoke during pregnancy. *Mutation Research*. **572**(1-2): 156-166.

Shen M. Berndt SI. Rothman N. Mumford JL. He X. Yeager M. Welch R. Chanock S. Keohavong P. Donahue M. Zheng T. Caporaso N. Lan Q. (2005) Polymorphisms in the DNA base excision repair genes APEX1 and XRCC1 and lung cancer risk in Xuan Wei, China. *Anticancer Research*. **25**(1B): 537-542.

Gao W. and Keohavong P. (2005) Analysis of K-RAS and P53 mutations in sputum samples. *Methods in Molecular Biology*, **291**:217-233.

Keohavong P. Xi L. Grant SG. (2005). Molecular analysis of mutations in the human HPRT gene. *Methods in Molecular Biology*, **291**: 161-170.

Keohavong, P., Lan, Q., Gao, W-M., Zheng, K.C., Mady, H.H., Melhem, M.F. and Mumford, J.L. (2005). Detection of p53 and K-ras mutations in sputum of individuals exposed to smoky coal emissions in Xuan Wei county, China. *Carcinogenesis*,**26**: 303-308.

Lan, Q., Mumford, J., Shen, M., DeMarini, D.M., Bonner, M.R., He, X., Yeager, M., Welch, R., Chanock, S., Tian, L., Chapman, R.S., Zheng, T., Keohavong, P., Caporaso, N., and Rothman, N. (2004) Oxidative damage-related genes *AKR1C3* and *OGGI* modulate risks for lung cancer due to exposure to PAH-rich coal combustion emissions. *Carcinogenesis*, **25**: 2177 - 2181.

Keohavong, P., Gao, W.M., Mady, H.H., Kanbour-Shakir, A., and Melhem, M.F. (2004) Analysis of p53 mutations in cells taken from paraffin-embedded tissue sections of ductal

carcinoma in situ and atypical ductal hyperplasia of the breast. *Cancer Letters*, **212**: 121-130.

Gao, W.M., Romkes, M., Siegfried, J.M., Luketich, J.D. and Keohavong, P. (2004) No association between the XPD Asp 312, 751, or XRCC1 399 polymorphisms and K-ras gene mutations in smoking non-small-cell lung cancer. *Cancer Epidemiol. Biomarkers & Prev.*, **13**: 673-675.

Keohavong, P., Gao, W-M., Zheng, K-C., Hussam, M., Qing, L., Mona, M., and Mumford, M. (2003) Detection of K-ras and p53 Mutations in Sputum Samples of Lung Cancer Patients Using Laser Capture Microdissection Microscope and Mutation Analysis. *Anal. Biochem.*, **324**: 92-99.

Gao, W.M., Romkes, M., Day, R.D., Siegfried, J.M., Luketich, J.D., Mady, H.H., Melhem, M.F. and Keohavong, P. (2003) Association of the DNA repair gene XPD Asp312Asn polymorphism with p53 gene mutations in tobacco-related non-small-cell lung cancer. *Carcinogenesis*, **24**: 1671-1676.

Gao, W.M., Mady, H., Yu, G.Y., Siegfried, J., Luketich, J.D., Melhem, M.F. and Keohavong, P. (2003) Comparison of p53 mutations between adenocarcinoma and squamous cell carcinoma of the lung: Unique spectra involving G to A transitions and G to T transversions in both histologic types. *Lung Cancer*, **40**:141-150.

Zhang, L.F., Gao W.M., Elders, E., Weissfeld, J., Whiteside, T., and Keohavong, P. (2003) Comparison of K-ras gene mutations in tumor and sputum DNA of patients with lung cancer. *Biomarkers*, **8**:156-161.

Keohavong, P., Lan, G., Gao, W.M., DeMarini, D.M., Mass, J.M., Li, X.M., Roop, B.C., Weissfeld, J., Tian, D., and Mumford, J.L. (2003). Mutations in the K-ras gene in lung carcinomas from nonsmoking women exposed to unvented coal smoke in China. *Lung Cancer*, **41**: 21-27.

Keohavong, P., Mady, H.H., Gao, W-M., Siegfried, J.M., Luketich, J.D., Melhem, M.D. (2001) Topographic analysis of K-ras mutations in histologically normal lung tissues and tumors of lung cancer patients. *British Journal of Cancer*, **85**: 235-241.

DeMarini, D.M., Landi, S., Tian, D., Hanley, N.M., Li,X., Hu.F., Roop, B.C., Mass, M.J., Keohavong, P., Gao, W.M., Olivier, M., Hainaut, P. and Mumford, J.(2001) Lung tumor KRAS and TP53 mutations in nosmokers reflects exposure to PAH-rich coal combustion emissions. *Cancer Res.*, **61**: 6679-6681.

Zayas, B., Zang, L-F., Grant, S.G., Keohavong, P. and Day, B.W. (2001) Mutational spectrum of N-hydroxy-N-acetyl-4-aminobiphenyl at HPRT exon 3 in TK6 cells. *Biomarkers*, **6**: 262-273.

Bigbee, W.L., Day, R. D., Grant, S. G., Keohavong, P., Xi, L., Zhang, L.F. and Ness, R. B. (1999) Impact of maternal lifestyle factors on newborns HPRT mutant frequencies and molecular spectrum - Initial results from the prenatal exposures and preeclampsia prevention (PEPP) study. *Mutat. Res.*, **431**:279-289.

Gealy, R., Zhang, L.F., Siegfried, J.M., Luketich, J.D. and Keohavong, P. Comparison of K-ras and p53 gene mutations in smoking and non-smoking women with lung cancer. *Cancer Epidemiology Biomarkers and Prevention*, (1999) **8**: 297-302.

Keohavong, P., Melacrinis, A.C., Shukla, R., Day, B.W., and ReHa-Krantz, L. Effects of bulky polycyclic aromatic hydrocarbon adducts on DNA replication by exonuclease-deficient T7 and T4 DNA polymerases. *DNA and Cell Biology* (1998), **17**: 541-549.

Siegfried J.M., Gillespie, A.T., Mera, R., Casey, T.J., Keohavong, P. and Hunt J.D. Prognostic values of specific K-ras mutations in lung adenocarcinomas. *Cancer Epidemiology Biomarkers and Prevention* (1997) **6**: 841-847.

Zhu, D., Keohavong, P., Finkelstein, S. D., Swalska, P., Bakker, A., Weissfeld, J., Srivastava, S. and Whiteside, T. L. K-ras mutations in normal colorectal tissues from K-ras mutation-positive colorectal cancer patients (1997) *Cancer Research*, **57**: 2485-2492.

Keohavong, P., Zhu, D., Melacrinis, A.C., DeMichelle, M.A.A., Weyant, R.J., Luketich, J.D., Testa, J.R., Fedder, M, and Siegfried, J.M. Detection of low fraction K-ras mutations in primary lung tumors using a sensitive method. *Int. J. Cancer* (1997) **74**: 162-170.

Keohavong, P., Zhu, D., Whiteside, T.L., Swalsky, P., Bakker, A, Elder, E.M., Siegfried, J.M., Srivastava, S. and Finkelstein, S.D. Detection of infrequent and multiple mutations in human tumors and tumor-adjacent tissues. *Anal. Biochem.*(1997) **247**: 394-403.

Przygodski, R.M., Finkelstein, S.D., Keohavong, P., Zhu, D., Bakker, A., Swalsky, P.A., Soini, Y., Ishak, K.G. and Bennett, W.P. Sporadic and thoro-thrast-induced angiosarcomas of the liver manifest frequent and multiple point mutations in K-ras-2. *Lab. Investigation* (1997). **76**: 153-159.

Zhu, D., Zhou, J. and Keohavong, P. Taq-amplified fragments appear as doublets in denaturing gradient gels. *Anal. Biochem.* (1997) **244**: 404-406.

Huang, H. and Keohavong, P.: Fidelity and mutations produced by Deep Vent wild type and 3' to 5' exonuclease-deficient DNA polymerases during *in vitro* DNA amplification. *DNA and Cell Biology* (1996) **15**: 589-594.

Keohavong, P., DeMichelle, M.A.A., Melacrinis, A.C., Landreneau, R.J., Weyant, R.J. and Siegfried, J.M.: Detection of K-ras mutations in lung carcinomas: Relationship to prognosis. *Clinical Cancer Research* (1996) **2**: 411-418.

Keohavong, P., Melacrinis, C.A. and Shukla, R. :Mutational spectrum of cyclopenta(*cd*) pyrene in the human HPRT gene. *Carcinogenesis* (1995) **16**: 855-860.

Sandhu, D.K. and Keohavong, P.: Effects of the T4 bacteriophage gene 32 product on the efficiency and fidelity of DNA amplification using T4 DNA polymerase. *Gene* (1994)

**144:** 53-58.

Shvedova, A.A., Kramarik, J.A., Keohavong, P., Chumakov, K.M. and Karol, M.H.: Use of anti-TNF- $\alpha$  antiserum to investigate toxic alveolitis arising from cotton dust exposure. *Exp. Lung Res.*, (1994) **20**: 297-315.

Pfeiffer, P., Thode, S., Hancke, J., Keohavong, P. and Thilly, W.: Resolution and conservation of mismatches in DNA joining. *Mutagenesis* (1994) **9**: 527-535.

Cohen, A.S., Smisek, D.L. and Keohavong, P.: Capillary gel electrophoresis of biopolymers. *Trends in Analytical Chemistry*, (1993) **12**: 195-202.

Keohavong, P., Ling, L., Dias, C. and Thilly, W.G. Predominant mutations induced by the thermostable Vent DNA polymerase during polymerase chain reaction. *PCR Methods and Applications* (1993) **2**: 288-292.

Keohavong, P. and Thilly, W.G.: Mutational spectra of benzo(a)pyrene-diol-epoxide in human cells. *Envir. Hlth. Perspect.* (1992) **98**: 215-219.

Cha, R.S., Zabl, H., Keohavong, P., and Thilly, W.G.: Mismatch Amplification Mutation Assay (MAMA): Application to the c-H-ras Gene. *PCR: Methods and Applications.* (1992) **2**: 14-20.

Keohavong, P., and Thilly, W.G.: Mutational Spectrometry: A general approach to detect point mutations in selectable genes *Proc. Natl. Acad. Sci. USA.* (1992), **89**,4623-4627.

Ling, L., Keohavong, P., Dias, C. and Thilly, W.G.: Optimization of PCR with regard to fidelity: Modified T7, Taq and Vent DNA polymerases. *PCR: Methods and Applications.* (1991) **1**: 27-33.

Keohavong, P., Liu, V.F. and Thilly, W.G.: Analysis of point mutations induced by ultra violet light in human cells. *Mut. Res.* (1991) **249**: 147-159.

Cariello, N.F., Keohavong, P., Kat, A.G. and Thilly, W.G.: Molecular analysis of complex human cell populations: Mutational spectra of MNNG and ICR-191. *Mut. Res.* (1990) **231**: 165-176.

Keohavong, P. and Thilly, W.G.: Fidelity of DNA polymerases in DNA amplification. *Proc. Natl. Acad. Sci. USA* (1989) **86**: 9253-9257.

Thilly, W.G., Liu, V.F., Brown, B., Cariello, N.F., Kat, A.G. and Keohavong, P.: Direct measurement of mutational spectra in humans. *Genome* (1989) **31**: 590-593.

Keohavong, P., C. Wang, R. Cha, and W.G. Thilly : Enzymatic amplification and characterization of large fragments from genomic DNA. *Gene* (1988) **71**,211-216.

Cariello, N.F., Scott, J.K., Kat, A.G., Thilly, W.G. and Keohavong, P.: Resolution of a missense mutant in human genomic DNA by denaturing gradient gel electrophoresis and direct sequencing using in vitro DNA amplification: HPRT-Munich. *Am. J. Human Genet.* (1988) **42**: 726-734.

Cariello, N.F., Keohavong, P., B. Sanderson, and W.G. Thilly : DNA damage produced by ethidium bromide staining and exposure to ultraviolet light. *Nucleic Acids Res.* (1988) **16**: 4157.

Keohavong, P., Kat, A.G., Cariello, N.F., and Thilly, W.G.: DNA amplification *in vitro* using T4 DNA polymerase. *DNA and Cell Biology* (1988) **7**: 63-70.

Schmitt, P., Gattoni, R., Keohavong, P. and Stevenin, J.: Alternative splicing of E1A transcripts of adenovirus required appropriate salt conditions. *Cell* (1987) **50**:31-39.

Keohavong, P., Gattoni, R., Schmitt, P. and Stevenin, J.: The different intron-2 species excised in vivo from the E2A premessenger of adenovirus-2: an approach to analyze alternative splicing. *Nucleic Acids Res.*(1986) **14**: 5207-5227.

Gattoni, R., Keohavong, P., and Stevenin, J.: Splicing of the E2A premessenger RNA of adenovirus-2: multiple pathways in spite of excision of the entire large intron. *J. Mol. Biol.* (1986) **187**: 379-397.

Keohavong, P., R. Gattoni, and J. Stevenin : High specificity of the cDNA-RNA assay to detect accurate splicing in vitro. *DNA* (1984), **3**: 331-338.

Keohavong, P., Gattoni, R., LeMoulllec, J.L., Jacob, M., and Stevenin, J.: The orderly splicing of the first leaders of the adenovirus-2 major late transcript. *Nucleic Acids Res.*(1982) **10**: 1215-1229.

Stevenin, J., Gattoni, R., Keohavong, P. and Jacob, M.: Mild nuclease treatment as a probe for non-random distribution of adenovirus specific RNA sequences and of cellular RNA in nuclear ribonucleoprotein fibrils. *J. Mol. Biol.* (1982) **155**: 185-205.

### **Manuscripts submitted, in revision or in preparation:**

Keohavong, P., Gao, W-M., Lan, Q, Zhang, L.F., Gealy, R., Weissfeld, J, Elders, E. and Whiteside, T. K-ras mutations in plasma from lung cancer patients and from mice treated with lung carcinogens.

Keohavong, P., Gao, W-M., Christie, N., Land, S., Luketich, J.D. and Siegfried, J.M. p53 and K-ras mutations in bronchoscopy specimens as biomarkers for lung cancer in former lung cancer patients.

## **2. Books and Book Chapters:**

Keohavong, P., and W.G. Thilly : Fidelity of DNA amplification in vitro. In Current Communications in Molecular Biology: Polymerase Chain Reaction. Cold Spring Harbor Laboratory Press, edited by Erlich , H.A., Gibbs, R. and Kazazian, H.H.(1989)pp 19-23.

Keohavong, P., and W.G. Thilly: Towards development of techniques to observe mutational spectra in human tissue samples. In: Cellular Responses to DNA Damage, M. Bignami, E. Dogliotti, and Essigmann, J.M. (Eds.). Annali dell'Istituto Superiore di Sanita, Roma.(1989) Vol 25., pp 219-222.

### **3. Published Proceedings and Abstracts:**

Keohavong, P., and W.G. Thilly: Measurement and analysis of mutational spectra induced in human cells by chemical exposure. In: International Conference on "Detection methods for DNA damaging agents in man: Applications in cancer, epidemiology and prevention". Espoo, Finland, September 2-4, 1987.

Soman, N.R., P.S. Larson, G.N. Wogan, N.F. Cariello, and P. Keohavong: Analysis of single base changes in rat liver tumor DNA by a PCR-DGGE method. In: Fifth Annual Meeting on Oncogenes. Hood College , Frederick, MD, June July 1, 1989.

Okinaka, R.T., Anzick, S.L., Strniste, G.F., Cariello, N.F., Keohavong, P., Oller. A. and Thilly, W.G: Application of DGGE in the molecular analysis of ionizing radiation-induced mutation in human cells. In: The 21st Annual Scientific Meeting of the Environmental Mutagen Society. Albuquerque, New Mexico, Vol 15, Supplement 17, 1990.

Keohavong, P., and W.G. Thilly: Analysis of mutational spectra in human cells. In: The 22nd Annual Scientific Meeting of the Environmental Mutagen Society. Kissimmee, Florida, Vol. 17, supplement 19, pp 37. April 6-11, 1991.

Keohavong, P., and W.G. Thilly: Point mutational spectra induced by benzo(a)pyrene-diol-epoxide (BPDE) in cultured human cells. In: International Conference on " Biomonitoring and Susceptibility Markers in Human Cancer: Applications in Molecular Epidemiology and Risk Assessment". Kailua-Kona, Hawaii, U.S.A., 26 October -1 November, 1991

Cohen, A.S., Karger, B.L., Keohavong, P. and Thilly, W.G.: Separation of homoduplex wild-type DNA from homoduplex mutant DNA with a single point mutations using Gel HPCE, presented at *HPLC' 91*, Basel, Switzerland, June 3-8, 1991.

Keohavong, P., Shukla, S. and Melacrinis, A.C.: Point mutational spectra induced by cyclopenta(c,d)pyrene in human cells. In: The sixth International Conference on the Environmental Mutagens. Melbourne, Australia, 21-26 February, 1993.

Shvedova, A.A., Kramarik, J.A., Keohavong, P., and Karol, M.H.: Role of TNF-a in the

development of toxic alveolitis following inhalation of organic dust. Presented at the Society of Toxicology Conference, Dallas, Texas, March 13-17, 1994.

Keohavong, P., DeMichelle, M.A.A., Melacrinis, A.M., Landreneau, R.J., Weyant, R.J. and Siegfried, J.M.: Detection of *K-ras* mutations in lung carcinomas by denaturing gradient gel electrophoresis: Relationships to prognosis. Presented at the American Association for Cancer Research Conference, Toronto, Canada, March 18-22, 1995.

Keohavong, P., DeMichelle, M.A.A., Finkelstein, S., Melacrinis, A.M., Landreneau, R.J., Weyant, R.J., and Siegfried, J.M.: *K-ras* and p53 mutations as Biomarkers for lung cancer. Presented at the Annual Lung Cancer Spore Investigators Meeting, National Cancer Institute, Rockville, MD, July 16 to 18, 1995.

Keohavong, P., Zhu, D., Melacrinis, A.M., DeMichelle, M.A.A., and Siegfried, J.M.: Detection of infrequent *K-ras* mutations in primary human lung carcinomas: relationship to prognosis. Presented at the 27th Environmental Mutagen Society annual meeting, Victoria, British Columbia, Canada, March 23-28, 1996.

Keohavong, P., Zhu, D., Finkelstein, S., Elder, E., Whiteside, T. and Srivastava, S.: *K-ras* mutations in the development of human non-small cell lung cancer. Presented at the 87th annual meeting of the American Association for Cancer Research, Washington D.C., April 20-24, 1996.

Keohavong, P., Gealy, R., Melacrinis, A.C., Chern, H.D., Persad, R., Branch, R.A. and Romkes, M. Xenobiotic metabolizing enzymes and p53 mutations as biomarkers for bladder cancer. Presented at the 88th annual meeting of the AACR, San Diego, CA, April 12-17, 1997.

Gealy, R., Zhang, L.F., Siegfried, J.M., and Keohavong, P. Mutations in the *K-ras* and p53 genes in smoking and non-smoking women. Presented at the 29th Environmental Mutagen Society annual meeting, Anaheim, CA, March 21-26, 1998.

Keohavong, P., Nukiu, T., Gealy, R., Zhang, L.F., Melacrinis, A.C., Chern, H.D., Persad, R., Branch, R.A. and Romkes, M. Association between xenobiotic metabolizing enzymes and p53 mutations in bladder cancer. Presented at the 89th annual meeting of the AACR, New Orleans, LA, March 28 - April 1, 1998.

Keohavong, P., Chern, H.D., Gujral, S., Persad, R.A., Branch, R.A., Romkes, M. and Probert J.L. Interaction between xenobiotic metabolizing enzymes and p53 mutations in bladder cancer. *J. Urol.*, 159 (5) Suppl: 278, 1998.

Probert, J.L., Keohavong, P., Chern, H.D., Gujral, S., Persad, R.A., Branch, R.A., Romkes. p53 mutations and drug metabolizing enzymes: relationship in bladder cancer. *Br. J. Urol.*, 81 (Suppl. 4), 1998.

- Zhang, L.F., Gealy, R., Weissfeld, J., Elder, E., Whiteside, T.L., and Keohavong, P. Comparison of K-ras mutations in tumor, sputum, and plasma DNA of lung cancer patients. Presented at the 90th annual meeting of the AACR, Philadelphia, PA, April 10-14, 1999.
- Xi, L., Grant, S.G., Day, R.D., Keohavong, P., Zhang, L.F., Ness, R.B. and Bigbee, W.L. The effects of maternal lifestyle factors on HPRT mutant frequency in human newborns. Presented at the 90th annual meeting of the AACR, Philadelphia, PA, April 10-14, 1999.
- Zayas, B., Zhang, L.F., Grant, S.G., Keohavong, P. and Day, B.W. Mutational spectrum of N-hydroxy-N-acetyl-4-aminobiphenyl at HPRT exon 3 in TK6 cells. Presented at the 90th annual meeting of the AACR, Philadelphia, PA, April 10-14, 1999.
- Zhang, L.F., Xi, L., Bigbee, W.L., Day, R.D., Ness, R.B. and Keohavong, P. Distinctive HPRT gene alterations in umbilical cord blood T-lymphocytes in newborns of tobacco smoke exposed mothers. Presented at the 90th Annual Meeting of the AACR, Philadelphia, PA, April 10-14, 1999.
- Zhang, L.F., Xi, L., Bigbee, W.L., Day, R.D., Ness, R.B. and Keohavong, P. HPRT gene alterations in umbilical cord blood T-lymphocytes in newborns of tobacco smoke exposed mothers. Presented at the 91st Annual Meeting of the AACR, San Francisco, CA, April 1-5, 2000 .
- Keohavong, P., Mady, H., Gao, W.M., Siegfried, J.M., Luketich, J.D. and Melhem, M. Topographic analysis of K-ras mutations in histologically normal lung tissues and tumors of patients with lung cancer. Presented at the 92<sup>th</sup> Annual meeting of the AACR, New Orleans, LA, March 24-28, 2001.
- Gao, WM., Lan, Q., DeMarini, D.M., Mass, M.J., Li, X.M., Roop, B.C., Weissfeld, J., Tian, D., Mumford, J.M. and Keohavong P. Mutations in the K-ras Gene in Lung Carcinomas from Nonsmoking Women Exposed to Unvented Coal Smoke in China. Environmental Mutagen Society, Anchorage, Alaska, April 27-May 1, 2002.
- Gao, W.M., Romkes, M., Day, R., Siegfried, J.M., Luketich, J., Mady, H., Melhem, M. and Keohavong, P. Association of the DNA repair gene *XPB* Asp312Asn polymorphism with p53 gene mutations in tobacco-related non-small-cell lung cancer. The 94<sup>th</sup> AACR annual meeting in Washington DC, July 4-9, 2003.
- Keohavong, P., Lan, Q., Gao, W-M., Zheng, K.C., Mady, H.H., Melhem, M.F. and Mumford, J.L. Detection of p53 and K-ras mutations in sputum of individuals exposed to smoky coal emissions in Xuan Wei county, China. The 95<sup>th</sup> AACR Annual Meeting in Orlando, March 27-31, 2004.
- Keohavong, P., Romkes, M., Gao, W-M., Zhong, S., Persad, R., Smith, J.B., and Branch, R. DNA repair genes *XPB* and *XRCC1* polymorphisms, p53 gene mutations and bladder cancer risk. The 97<sup>th</sup> AACR Annual Meeting, April 1-5, 2006, Washington, DC, pp 485.



- Liu Y, Lan Q, Gao, W-M., Siegfried JM, Luketich JD, Keohavong P. Promoter Methylation of RASSF1A and DAPK Genes in Lung Tumors from Smoking and Never-Smoking Lung Cancer Patients. The 97<sup>th</sup> AACR Annual Meeting, April 1-5, 2006, Washington, DC, pp 12.
- Zhang, W., Stabile, L.P., Keohavong, P., Romkes, M., Grandis, J.R., Schillr, J.H., Traynor, A.M., and Siegfried, J.M. Variation in the EGFR-TK and mutations in K-ras and p53 in Lung Cancer. The 97<sup>th</sup> AACR Annual Meeting, April 1-5, 2006, Washington, DC, pp 50.
- Gao, W-M., Liu, Y., Siegfried JM, Christie, N., Gaither-Davis, A., Luketich JD, Keohavong P. K-ras, p53 mutations and p16 promoter methylation in bronchoscopy samples from former lung cancer patients. The 98<sup>th</sup> AACR Annual Meeting, April 14-18, 2007, Los Angeles, pp 87.
- Stabile, L., Rothstein, M., Keohavong, P., Kim, K., Land, S., Lenzner, D. and Siegfried, J. Therapeutic targeting of both the HGF and EGFR pathways results in additive inhibition of tumorigenesis in HGF transgenic mice. The 100<sup>th</sup> AACR Annual Meeting, April 18-22, 2009, Denver, CO, Abstract 4298.
- Keohavong, P., Kahkonen, B., Kinchington, E., Yin, J., Jin, J., Siegfried, JM. And Peter Di. Pulmonary inflammation and lung tumorigenesis in mice. The 101<sup>st</sup> AACR Annual Meeting, April 17-21, 2010, Washington, DC, Abstract 4377.
- Birru R, Kahkonon B, Kingchiton E, Keohavong P, Di Y. Synergistic lung tumorigenesis by cigarette smoke carcinogen and chronic inflammation. Presented at: Translational Research Cancer Centers Consortium (TRCCC) 2012 Feb 22 - 24. Seven Springs, U.S.A.
- Shvedova AA, Yanamala N, Kisin ER, Tkach AV, Murray AR, Hubbs A, Chirila MM, Keohavong P, Sycheva LP, Kagan VE, Castranova. One year pulmonary outcomes after exposure to carbonaceous nano-engineered materials and asbestos. Presented at the 53<sup>rd</sup> Society of Toxicology Annual Meeting at Phoenix, Arizona, March 23-27, 2014. Abstract 2004d.
- Lu, C., Chen, L., Keohavong, P. and Gao, WM. Overexpression of CRM1: a characteristic feature of the transformed phenotype in lung carcinogenesis. Presented at the 53<sup>rd</sup> Society of Toxicology Annual Meeting at Phoenix, Arizona, March 23-27, 2014. Abstract 1507.
- Gao W, Lu C, Chen L, Keohavong P. CRM1 is overexpressed in lung tumorigenesis and represents an adjuvant target for lung cancer treatment. Poster presented at: AACR 2015 Apr 18 - 22. Philadelphia.

#### 4. Invited Articles

Keohavong, P. and Thilly, W.G:

Use of PCR and DGGE to analyze point mutational spectra. In: The PCR: An in vitro replication system. French version publisher: LAVOISIER PRESS Paris; English version publisher: INTERCEPT, London, England. Editor: Daniel Larzul at the Louis Pasteur Institute, Paris. (Date of publication: December 1993).

Keohavong, P. and Thilly, W.G:

Use of Denaturing Gradient Gel Electrophoresis to determine the fidelity of DNA polymerases. In: A laboratory manual for Denaturing Gradient Gel Electrophoresis. Academic Press; Editor: Lerman, L.S. and Ezra, A. Date of publication: April 1994

## 5. Presentations

National Cancer Institute, Rockville, MD, August 20th, 2003, Title: "Mutations in K-ras/p53 genes and genotypes of DNA repair polymorphism as biomarkers for lung cancer.

The Chitaqua Breast Cancer Symposium, June 7-8, 1998. Title: "Oncogene mutations as biomarkers for colorectal cancer".

National Cancer Institute, Rockville, MD, June 8-9, 1995. Title: " Analysis of K-ras mutations in preneoplastic lesions of lung tumors ".

Northwestern University, Chicago, May 16, 1991. Title " Point mutational spectra of environmental carcinogens in human cells ".

Boston University, April 23 1991. Title " Analysis of mutational spectra in human cells and in humans ".

University of California at Berkeley, September 5, 1990. Title:" Point mutational spectra as biomarkers for human risk assessment ".

University of California at Berkeley, September 5, 1990. Title:" Point mutational spectra as biomarkers for human risk assessment ".

Yale University, December 21, 1990. Title: "Mutational Spectra: Relevance to human diseases"

Banbury Conference Center of Cold Spring Harbor. Conference on Polymerase Chain Reaction during December 12-14, 1988. Title of the talk: " Fidelity of D amplification *in vitro* "

## **SERVICE**

### **1. Service to School and University**

<b>Years</b>	<b>Committee</b>	<b>Position</b>
1993	Public Health Career Opportunity Program (PHCOP)	Member
1993 – 2001	Diversity Committee	Member
1995-1997	University-wide and Health Sciences Relationships Task Force	Member
1992 – 1995	Exam-Promotion Committee	Member
2012 – present	Planning and Budgeting Policies Committee (PBPC)	Member
2010 – present	Dean’s Day Competition GSPH students	Judge

### **2. Service to Field of Scholarship**

#### **a. Editorial Board and Advisory Board**

Editorial Board for the Balkan Journal of Medical Genetics (1997 - present)

#### **b. Manuscript and Other Documents/Publication Review**

Served as a reviewer of manuscripts for the following journals:

*Analytical Biochemistry*  
*Archives of Biochemistry and Biophysics*  
*Balkan Journal of Medical Genetics*  
*Biotechniques*  
*British Journal of Cancer*  
*Cancer Research*  
*Cancer Epidemiology Biomarkers & Prevention*  
*Cancer Detection and Prevention*  
*Carcinogenesis*  
*Clinical Cancer Research*

*DNA and Cell Biology*  
*Environmental Health Perspectives*  
*Environmental and Molecular Mutagenesis*  
*Expert Review of Respiratory Medicine*  
*Gene*  
*Gynecologic Oncology*  
*International Journal of Cancer*  
*Journal of Cancer Research and Clinical Oncology*  
*Journal of the National Cancer Institute*  
*Lung Cancer*  
*Molecular Carcinogenesis*  
*Mutation Research*  
*Nature Medicine*  
*PCR: Methods and Applications*

### **c. Study Sections, Review Panels, and Advisory Boards**

Review Panel for:

NCI/NIH: U01 applications submitted to PAR16-051 (Innovative Approaches to the Prevention and Early Detection of Small Cell Lung Cancer) and PA-16-049 (Therapeutic Development and Mechanisms of Resistance). March 14, 2018.

The American Institute of Biological Sciences, Flight Attendant Medical Research Institute, Sterling, Virginia, 2002 - 2010.

The Pennsylvania Breast and Cervical Cancer, 01/07/2013

Qatar National Research Fund, 02/25/2013

Qatar National Research Fund, 02/21/2014

The Toxicology Fellowship Program of the US Environmental Protection Agency, Washington, DC, January 19-20, 2006.

The American Institute of Biological Sciences, Childhood Cancer Research, Chantilly VA, July 11 -13, 2006.

Advisory Board

Member of the International Symposium on Clinical Oncology Advisory Board, 2003-2004.