

**Curriculum Vitae**  
**Ivana Verona Yang, Ph.D.**

**ADDRESS** National Jewish Health  
1400 Jackson Street  
Smith Building; A630  
Denver, CO 80206  
(303) 270-2589  
(303) 270-2136 (fax)  
yangi@njhealth.org

**EDUCATION**

2000 **University of North Carolina at Chapel Hill, Chapel Hill, NC**  
Ph.D. Chemistry

1996 **College of William and Mary, Williamsburg, VA**  
B.S. Chemistry/Mathematics

**Additional Courses:**

2008 **SOLiD Next-Generation Sequencing**, Applied Biosystems  
2005 **Principles of Quantitative Genetics, QTL Mapping I, and QTL Mapping II**,  
Summer Institute in Statistical Genetics, NC State University  
2004 **Classical Readings in Statistical Human Genetics**, Center for Human Genetics,  
Duke University Medical Center  
2002 **Genome Sequence Analysis**, Jackson Laboratories  
2001 **PERL Programming**, Sun Educational Services  
1998 **Inorganic Biochemistry Summer Workshop**, Center for Metalloenzyme Studies,  
University of Georgia

**PROFESSIONAL EXPERIENCE**

2008-present **Assistant Professor**, Department of Medicine, National Jewish Health  
**Assistant Professor**, Department of Medicine, University of Colorado Denver  
**Deputy Director**, Center for Genes, Environment, and Health

2005-2008 **Staff Scientist**, Laboratory of Environmental Lung Disease, National Institute of  
Environmental Health Sciences (NIEHS) and National Heart Lung and Blood Institute  
(NHLBI)

2003-2005 **Assistant Research Professor**, Department of Medicine, Duke University Medical  
Center

2000-2003 **Postdoctoral Fellow**, Department of Mammalian Genomics, The Institute for  
Genomic Research

1996-2000 **Research Assistant and Teaching Assistant**, Department of Chemistry, University  
of North Carolina at Chapel Hill

1994-1996 **Research Fellow (Honors Research) and Teaching Assistant**, Department of  
Chemistry, College of William and Mary

**HONORS AND AWARDS**

2003	EU-US Workshop on Molecular Signatures of DNA Damage Induced Stress Response Young Scientist Travel Award
2002	Aspen Cancer Conference Young Investigator
1996	Phi Beta Kappa National Honor Society (1996)
1996	American Institute of Chemists Undergraduate Award
1996	Highest Honors in Chemistry/Magna Cum Laude, College of William and Mary
1996	American Chemical Society certification
1995	Llanso-Sherman Fellowship for Research in Natural Sciences
1995	Mortar Board National Honor Society

## SERVICE

2009-present	<b>WV-INBRE External Advisory Committee</b>
2007-2008	<b>NIEHS Division of Intramural Research (DIR) Committee on Promotions III</b>
2000-present	<b>Manuscript reviewer</b> for Am J Physiol Lung Cell Mol Physiol, Am J Resp and Crit Care Med, Bioinformatics, Biotechniques, Critical Care Medicine, FEBS Letters, Genes and Immunity, Genomics, International Journal of Cancer, and Nucleic Acids Research

## PUBLICATIONS

### Original Manuscripts:

1. **Verona, I.**, Gutheil, J.P., Pike, R.D., Carpetner, G.B. Regioselectivity in the nucleophilic functionalization of dibenzofuran, dibenzothiophene, and xanthene complexes of Mn(CO)<sup>3+</sup>. *J. Organometallic Chem.* **524**, 71-80 (1996).
2. **Yang, I.V.**, Thorp, H.H. [Ru(bpy)<sub>3</sub>]<sup>2+</sup>-mediated guanine oxidation in DNA polymers and in oligonucleotides containing trinucleotide repeat sequences. *Inorg. Chem.* **39**, 4969-4976 (2000).
3. Weatherly, S.C., **Yang, I.V.**, Thorp, H.H. Proton-coupled electron transfer in duplex DNA: driving force dependence and isotope effects on electrocatalytic oxidation of guanine. *J. Am. Chem. Soc.* **123**, 1236-1237(2001).
4. **Yang, I.V.**, Thorp, H.H. Oxidation of 7-deazaguanine: mismatch-dependent electrochemistry and selective strand scission. *Inorg. Chem.* **40**, 1690-1697 (2001).
5. Baik, M.-H., Silverman, J.S., **Yang, I.V.**, Szalai, V.A., Ropp, P.A., Yang, W., Thorp, H.H. Using density functional theory to develop a complete set of oxidizable nucleobases. *J. Phys. Chem. B* **105**, 6437-6444 (2001).
6. **Yang, I.V.**, Thorp, H.H. Modification of indium tin oxide electrodes with repeat polynucleotides: electrochemical detection of trinucleotide repeat expansion. *Anal. Chem.* **73**, 5316-5322 (2001).
7. **Yang, I.V.**, Thorp H.H. Toward electrochemical resolution of two genes on one electrode: using 7-deaza analogs of guanine and adenine to prepare PCR products with differential redox activity. *Anal. Chem.* **74**, 347-354 (2002).
8. **Yang, I.V.**, Chen, E., Hasseman, J.P., Liang, W., Frank, B.C., Wang, S., Sharov, V., Saeed, A.I., White, J., Li, J., Lee, N.H., Yeatman, T.J., Quackenbush, J. Within the fold: assessing differential expression measures and reproducibility of microarray assays. *Genome Biol.* **3**, research0062 (2002).

9. The FANTOM Consortium and the RIKEN Genome Exploration Research Group Phase I and II Team. Analysis of the mouse transcriptome based on functional annotation of 60,770 full-length cDNAs. *Nature* **420**, 563-573 (2002).
10. Weatherly, S.C., **Yang, I.V.**, Armistead, P.M., Thorp, H.H. Proton-coupled electron transfer in guanine oxidation: effects of isotope, solvent, and chemical modification. *J. Phys. Chem. B.* **107**, 372 (2003).
11. Chen, T., **Yang, I.**, Irby, R., Shain, K.H., Wang, H.G., Quackenbush, J., Coppola, D., Yeatman, T.J. Regulation of caspase expression and apoptosis by adenomatous polyposis coli. *Cancer Res.* **63**, 4368-4374 (2003).
12. Gore, M.R., Szalai, V.A., Ropp, P.A., **Yang, I.V.**, Silverman, J.S, Thorp, H.H. Detection of attomole quantities of DNA targets on gold microelectrodes by electrocatalytic nucleobase oxidation. *Anal. Chem.* **75**, 6586-92 (2003).
13. Bloom, G.\* , **Yang, I.V.\***, Boulware, D., Kwong, K.Y., Coppola, D., Eschrich, S., Quackenbush, J., Yeatman, T.J. Multi-platform, multi-site, microarray-based human tumor classification. *Am. J. Pathol.* **164**, 9-16 (2004) (\*authors contributed equally).
14. Sharov, V., Kwong, K.Y., Frank, B.C., Chen, E., Hasseman, J.P., Gaspard, R., Yu, Y., **Yang, I.**, Quackenbush, J. The limits of log-ratios. *BMC Biotechnol.* **4**, 3 (2004).
15. Bloomston, M., Durkin, A., **Yang, I.**, Rojiani, M., Rosemurgy, A.S., Enkmann, S., Yeatman, T.J., Zervos, E.E. Identification of molecular markers specific for pancreatic neuroendocrine tumors by genetic profiling of core biopsies. *Ann. Surg. Oncol.* **11**, 413-9 (2004).
16. Qin, L.-X., Kerr, K.F. and Contributing Members of the Toxicogenomics Research Consortium. Empirical evaluation of data transformations and ranking statistics for microarray analysis. *Nucleic Acids Res.* **32**, 5471-79 (2004).
17. Eschrich, S., **Yang, I.**, Bloom, G., Kwong, K. Y., Boulware, D., Cantor, A., Coppola, D., Kruhøffer, M., Aaltonen, L., Orntoft, T. F., Quackenbush, J. Yeatman, T.J. Molecular staging for survival prediction of colorectal cancer patients. *J. Clin. Oncol* **23**, 3526-35 (2005).
18. Kwong, K.Y., Bloom, G.C., **Yang, I.**, Boulware, D., Coppola, D., Hasseman, J., Chen, E., McGrath, A., Makusky, A.J., Taylor, J., Steiner, S., Zhou, J., Yeatman, T.J., Quackenbush, J. Synchronous global assessment of gene and protein expression in colorectal cancer progression. *Genomics* **86**, 142-58 (2005).
19. Burch, L.H., **Yang, I.V.**, Whitehead, G.S., Berman, K.G., Chao, F.G., Schwartz, D.A. Transcriptional response to endotoxin reveals role for interferon gamma in lung neutrophil recruitment. *Am. J. Physiol. Lung Cell. Mol. Physiol.* **291**, L677-82 (2006).
20. **Yang, I.V.**, Burch, L.H., Steele, M.P., Savov, J.D., Hollingsworth, J.W., Berman, K.G., Speer, M.C., Brown, K.K., Schwarz, M.I., Schwartz, D.A. Gene expression profiling of familial and sporadic interstitial pneumonia. *Am. J. Resp. Crit. Care Med.* **175**, 45-54 (2007) (with accompanying editorial).
21. Brass D.M.\* , **Yang I.V.\***, Kennedy M.P., Whitehead G.S., Rutledge H., Burch L.H., Schwartz D.A. LPS-induced airway remodeling is a fibroproliferative process. *Immunogenetics* **60**, 353-69 (2008). (\*authors contributed equally).
22. Huang Y.C.T., Li Z., Carter J.D., Schwartz D.A., **Yang I.V.** Fine ambient particles induce oxidative stress and metal binding genes in human alveolar macrophages. *Am J Respir Cell Mol Biol.* **41**: 544-52 (2009).

23. **Yang I.V.**, Wade C.M., Kang H.M., Alper S., Lackford B., Rutledge H., Eskin, E., Daly, M.J., Schwartz D.A. Identification of Novel Genes that Mediate Innate Immunity using Inbred Mice. *Genetics*. **183**,1535-44 (2009).

24. **Yang I.V.**, Alper S., Lackford, B., Rutledge, H., Warg, L., Burch L.H., Schwartz, D.A. Hedgehog signaling and the E2F1 transcription factor regulate the murine response to systemic LPS. *The Journal of Immunol.* In revision.

#### **Manuscripts in preparation/under review:**

1. Singh J., Tomfohr J., Sundy J.S., Foss C.M., McElvania-Tekippe E., Yang J., **Yang I.V.**, Schwartz D.A. *In vivo* Gene Expression is Influenced More by Specific Airway Challenges than by Disease State in Allergic Asthmatics. Under review.

2. Tomfohr J., Singh J., Sundy J.S., Foss C.M., Florence, S., McElvania-Tekippe E., Yang J., **Yang I.V.**, Schwartz D.A. Airway epithelial cell gene expression reveals signatures of disease and exposure status in allergic asthma. Under review.

3. **Yang, I.V.**, Rutledge, H., Yang, J., Sevilla, S., Ramsberger, J., Schwartz, D.A. A novel locus on Chromosome 9 is associated with host response to systemic LPS. In preparation.

4. **Yang I.V.**, Jiang W., Rutledge H.R., Lackford B., Pisetsky D.S., Schwartz D.A. Identification of novel innate immune genes by gene expression profiling of RAW264.7 macrophages stimulated with LPS, Poly(I:C) and CpG DNA. In preparation.

5. Rutledge H.R., Jiang W., Yang J., Pisetsky, D.S., Schwartz D.A., **Yang I.V.** Gene expression profiles of RAW264.7 macrophages stimulated with two commonly used preparations of LPS. In preparation.

#### **Book Chapters and Review Articles:**

1. **Yang, I.V.** "Creating and hybridizing spotted DNA arrays", In Encyclopedia of Genetics, Genomics, Proteomics, and Bioinformatics, (Dunn, M.J., Jorde, L.B., Little, P.F.R., and Subramaniam, S., Eds.), Wiley, New York 2005.

2. **Yang, I.V.** "The use of spike-in controls in microarray experiments", in Methods in Enzymology, Kimmel, A. R. and Oliver, B., eds, Elsevier, 411, 50-63 (2006).

3. Brass, D.M., Tomfohr, J., **Yang, I.V.**, Schwartz, D.A. Using mouse genomics to understand idiopathic interstitial fibrosis. *Proc. Am. Thorac. Soc.* **4**, 92-100 (2007).

#### **PATENTS**

1. Method for Electrochemical Detection of Multiple Target Compounds; H. H. Thorp, **I. V. Yang**, D. H. Stewart, J. W. Groelke; US Patent 7202028, Awarded April 10, 2007; WO 03/089895; Australia, Serial Number 2002367807; Europe, EP1583842.

#### **PRESENTATIONS**

##### **Invited Talks/Lectures:**

1. Yang, I.V. Microarray expression analysis. Bioinformatics: Principles and Applications I. FAES Graduate School at the NIH 2001

2. Yang, I.V. Cancer classification and survival analysis using gene expression profiling. TAUG Meeting 2003
3. Yang, I.V. Using spike-in controls and reference RNA in microarray experiments. ERCC Bioinformatics Workshop 2004
4. Yang, I.V. Endotoxin responsiveness candidate genes: rationale for choosing them. PHARE Symposium 2008
5. Yang, I.V. The role of *in utero* exposures and epigenetics in the development of asthma and atopy. European Respiratory Society Annual Congress 2009

**Talks Selected from Submitted Abstracts:**

1. **Yang, I.V.** Universal gene chip based human tumor classification. NCI Director's Challenge PI Meeting 2002
2. **Yang, I.V.** Universal gene chip based human tumor classification. Society of Surgical Oncology Annual Meeting 2003
3. **Yang, I.V.** Gene Expression Analysis of the Idiopathic Interstitial Pneumonias. NIEHS Toxicogenomics Research Consortium (TRC) Meeting 2003
4. **Yang, I.V.** Identifying asthma susceptibility genes by gene expression profiling of airway epithelial cells following subsegmental airway challenges. International Congress of Immunology/FOCIS Annual Meeting 2004
5. **Yang, I.V.** Gene expression profiling distinguishes familial and non-familial forms of pulmonary fibrosis. American Thoracic Society International Conference 2005
6. **Yang, I.V.** Genetic Determinants of Inter-Strain Variability Following Systemic LPS Challenge. American Thoracic Society International Conference 2006
7. **Yang, I.V.**, Fowler, V. G., Alper, S. Genetics of Innate Immunity. Toxicogenomics Research Consortium (TRC) Meeting 2006
8. **Yang I.V.**, Alper S., Lackford B., Rutledge H.R., Burch L.H., Schwartz D.A. Regulation of Gene Expression in the Liver, Lung, and Spleen of Sensitive and Resistant Strains of Mice In Responses to Systemic LPS. American Thoracic Society International Conference 2008

**Abstracts Presented at Conferences:**

1. **Verona, I.**, Thorp, H.H. Detection and mechanism of trinucleotide repeat expansion. Inorganic Biochemistry Summer Workshop 1998
2. **Verona, I.**, Thorp, H.H. Role of slipped DNA structures in trinucleotide repeat disorders studied using an electron-transfer metallonuclease. American Chemical Society Meeting 1999
3. **Yang, I.V.**, Armistead, P.M., Thorp, H.H. Detection of subfemtomole quantities of amplicons of HER-2 mRNA immobilized on metal oxide electrodes. Era of Hope Department of Defense Breast Cancer Research Meeting 2000
4. **Yang, I.V.**, Thorp, H.H. Electron transfer from 7-deazaguanine to ruthenium polypyridyl complexes. American Chemical Society Meeting 2000

5. **Yang, I.V.**, Chen, E., Gaspard, R.M., Hasseman, J.P., Yu, Y., Lee, N.H., Lazaridis, E., Yeatman, T.J., Quackenbush, J.. Towards a statistical foundation for differential expression in microarrays. Genome Sequencing and Biology Cold Spring Harbor Meeting 2001
6. **Yang, I.V.**, Chen, E., Hasseman, J. P., Coppola, D., Yeatman, T.J., Quackenbush, J. Gene expression fingerprints for molecular classification of cancer. New Frontiers in Cancer Detection and Diagnosis Gordon Research Conference 2002
7. **Yang, I.V.**, Chen, E., Hasseman, J. P., Coppola, D., Yeatman, T.J., Quackenbush, J. Gene expression fingerprints for molecular classification of cancer. Oncogenomics 2002
8. **Yang, I.V.**, Kwong, K.Y., Chen, E., Hasseman, J. P., Coppola, D., Yeatman, T.J., Quackenbush, J. Gene expression fingerprints for molecular classification of cancer. Genome Sequencing and Biology Cold Spring Harbor Meeting 2002
9. **Yang, I.V.**, Bloom, G.C., Kwong, K.Y., Chen, E., Hasseman, J. P., Coppola, D., Yeatman, T.J., Quackenbush, J. Gene expression fingerprints for molecular classification of cancer. Aspen Cancer Conference 2002
10. **Yang, I.V.**, Bloom, G.C., Kwong, K.Y., Chen, E., Hasseman, J. P., Coppola, D., Yeatman, T.J., Quackenbush, J. Universal gene chip based human tumor classification. NCI Director's Challenge PI Meeting 2002
11. **Yang, I.V.**, Burch, L.H., Dressman, H.K., Whitehead, G.S., Berman, K.G., Schwartz, D.A. Lypopolysaccharide(LPS)-mediated immune and stress responses. EU-US Workshop on Molecular Signatures of DNA Damage Induced Stress Response 2003
12. **Yang, I.V.**, Burch, N.H., Savov, J.D., Hollingsworth, J.W., Berman, K.G., Galvin, J.A., Steele, M. P., Schwartz, D.A. Gene Expression Analysis of the Idiopathic Interstitial Pneumonias. NIEHS Toxicogenomics Reseach Consortium (TRC) Meeting 2003
13. **Yang, I.V.**, Yu, Y., Sundy, J.S., Foss, C.M., Berman, K.G., McElvania-Tekkipe, E., Quackenbush, J., Schwartz, D.A. Identifying asthma susceptibility genes by gene expression profiling of airway epithelial cells following subsegmental airway challenges. International Congress of Immunology/FOCIS Annual Meeting 2004
14. **Yang, I.V.**, Burch, L.H., Steele, M.P., Savov, J.D., Hollingsworth, J.W., Berman, K.G., Speer, M.C., Brown, K.K., Schwarz, M.I., Schwartz, D.A. Gene Expression Profiling Distinguishes Familial and Non-familial Forms of Pulmonary Fibrosis. NIEHS Toxicogenomics Reseach Consortium (TRC) Meeting 2004
15. **Yang, I.V.**, Burch, L.H., Steele, M.P., Savov, J.D., Hollingsworth, J.W., Berman, K.G., Speer, M.C., Brown, K.K., Schwarz, M.I., Schwartz, D.A. Gene expression profiling distinguishes familial and non-familial forms of pulmonary fibrosis. American Thoracic Society International Conference 2005  
*Selected as one of the 24 abstracts best representing focus and quality of research presented at the conference.*
16. **Yang, I.V.**, Burch, L.H., Vinogradova, T., Rutledge, H.R., Schwartz, D.A. Genetic determinants of inter-strain variability following systemic LPS challenge. Gene Expression and Signaling in the Immune System Cold Spring Harbor Meeting 2006
17. **Yang, I.V.**, Burch, L.H., Vinogradova, T., Rutledge, H.R., Schwartz, D.A. Genetic determinants of inter-Strain variability following systemic LPS challenge. American Thoracic Society International Conference 2006

18. **Yang, I.V.**, Burch, L.H., Vinogradova, T., Rutledge, H.R., Schwartz, D.A. Genetic determinants of inter-strain variability following systemic LPS challenge. NIEHS Toxicogenomics Research Consortium (TRC) Meeting 2006

19. **Yang, I.V.**, Rutledge, H., Yang, J., Ramsberger, J., Schwartz, D.A. A novel locus on murine Chromosome 9 is associated with the systemic response to LPS. NIEHS Toxicogenomics Research Consortium (TRC) Meeting 2006

20. **Yang I.V.**, Wade C.M., Kang H.M., Alper S., Rutledge H.R., Lackford B., Eskin E., Daly M.J., Schwartz D.A. Identification of Novel Innate Immunity Genes in Mice In response to Systemic LPS. Keystone Innate Immunity Meeting 2008

21. **Yang I.V.**, Wade C.M., Kang H.M., Alper S., Rutledge H.R., Lackford B., Eskin E., Daly M.J., Schwartz D.A. Identification of Novel Innate Immunity Genes in Mice In response to Systemic LPS. American Thoracic Society International Conference 2008

22. **Yang I.V.**, Alper S., Lackford B., Rutledge H.R., Burch L.H., Schwartz D.A. Regulation of Gene Expression in the Liver, Lung, and Spleen of Sensitive and Resistant Strains of Mice In Responses to Systemic LPS. American Thoracic Society International Conference 2008

23. Rutledge H.R., **Yang I.V.**, Yang J., Schwartz D.A. Study of Positional Candidates within the Locus on Chromosome 9 Associated with Response to Systemic LPS. American Thoracic Society International Conference 2008

24. **Yang I.V.**, Jiang W., Rutledge H.R., Lackford B., Pisetsky D.S., Schwartz D.A. Identification of Novel Innate Immune Gene Expression Profiling of RAW264.7 Macrophages Stimulated with LPS, Poly(I:C) and CpG DNA. American Thoracic Society International Conference 2008

25. Rutledge H.R., Jiang W., Yang J., Pisetsky D.S., Schwartz D.A., **Yang I.V.** Gene Expression Profiles of RAW264.7 Macrophages Stimulated with two Commonly Used Preparations of LPS. American Thoracic Society International Conference 2008

26. **Yang I.V.**, Warg L.A., Davidson E.J., Kelada S.N.P., Kubalanza K., Collins, F.C., Miller D., Chesler E., Churchill G., Aylor D., Pardo-Manuel de Villena F., Schwartz D.A. Innate Immune Gene Discovery Using Macrophage Response to Pathogen-Associated Molecular Patterns (PAMPS). Aspen Lung Conference 2009

27. **Yang I.V.**, Warg L.A., Davidson E.J., Kelada S.N.P., Kubalanza K., Collins, F.C., Miller D., Chesler E., Churchill G., Aylor D., Pardo-Manuel de Villena F., Schwartz D.A. Innate Immune Gene Discovery Using Macrophage Response to Pathogen-Associated Molecular Patterns (PAMPS). International Mammalian Genome Society 2009 (selected for poster presentation)

## GRANT SUPPORT

<u>Title</u>	<u>Period</u>	<u>Total Direct Funding</u>
<b>Active:</b>		
NIH-NHLBI: RO1-HL095393 Genomic Signatures for Idiopathic Interstitial Pneumonia Principal Investigator: Schwartz Co-investigator: Yang	9/24/08-7/31/12	\$2,000,000
NIH-NCRR: P20-RR016477 WV-INBRE II	5/01/09-4/30/14	\$10,000,000

