

BIOGRAPHICAL SKETCH

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NAME: Wang, Kai

eRA COMMONS USER NAME (credential, e.g., agency login): wangkai

POSITION TITLE: Professor of Biostatistics

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Lanzhou University, Lanzhou, Gansu	BA	07/1986	Mathematics
Nankai University, Tianjin	MA	07/1989	Economics
University of Iowa, Iowa City, Iowa	MS	05/1996	Economics
University of Iowa, Iowa City, Iowa	PhD	12/1999	Statistics

A. Personal Statement

I am an established statistician with extensive experience in statistical modeling and analysis of large data (sequence, genomics, microarray, and imaging data), clustered data (family data, repeated measurements, and longitudinal data), categorical data, and time to event data. I have a record of productive collaboration with researchers of diverse research interests. I have served on a number of PhD dissertation committees of toxicology students. My methodology research includes study of replication samples, statistic methods for quantitative trait loci (QTL) mapping, genetic heterogeneity, gene-gene interaction, and QTL mapping using multiple phenotypes (pleiotropy). During the past 20 years as a faculty member, I have taught a wide range of biostatistics courses including "Biostatistics Method I", "Biostatistics Method II", "Applied Survival Analysis", and "Categorical Data Analysis", and seminar courses. I will provide assistance to data analysis for this project.

1. Mendy A, Metwali N, Perry SS, Chrischilles EA, Wang K, Thorne PS. Household endotoxin reduction in the Louisa Environmental Intervention Project for rural childhood asthma. *Indoor Air*. 2020;30(1):88-97. PubMed PMID: [31605641](#).
2. Rohlman DS, Ismail A, Bonner MR, Abdel Rasoul G, Hendy O, Ortega Dickey L, Wang K, Olson JR. Occupational pesticide exposure and symptoms of attention deficit hyperactivity disorder in adolescent pesticide applicators in Egypt. *Neurotoxicology*. 2019;74:1-6. PubMed PMID: [31077682](#).
3. Wang K. Maximum Likelihood Analysis of Linear Mediation Models with Treatment-Mediator Interaction. *Psychometrika*. 2019;84(3):719-48. PubMed PMID: [31077016](#).
4. Roh T, Lynch CF, Weyer P, Wang K, Kelly KM, Ludewig G, Wang K. Low-level arsenic exposure from drinking water is associated with prostate cancer in Iowa. *Environ Res*. 2017;159:338-343. PubMed PMID: [28841521](#).

B. Positions and Honors

Positions and Employment

1999 - 1999	Research Assistant Professor, Medical Statistics Section, Department of Medicine, University of Alabama at Birmingham, Birmingham, AL
1999 - 1999	Biostatistician, Comprehensive Cancer Center, University of Alabama at Birmingham, Birmingham, AL
1999 - 2003	Assistant Professor, Department of Biostatistics, College of Public Health, University of Iowa, Iowa City, IA
2003 - 2005	Assistant Professor, Program in Public Health Genetics, College of Public Health, University of Iowa, Iowa City, IA
2005 - 2007	Associate Professor, Program in Public Health Genetics, College of Public Health, University of Iowa, Iowa City, IA
2007 - 2013	Associate Professor, Department of Biostatistics, College of Public Health, University of Iowa, Iowa City, IA
2010 - 2013	Associate Professor, Interdisciplinary Graduate Degree Program in Informatics, Bioinformatics Subtrack, University of Iowa, Iowa City, IA
2013 -	Professor, Department of Biostatistics, College of Public Health, University of Iowa, Iowa City, IA

Other Experience and Professional Memberships

2002 –	Member, International Genetic Epidemiology Society
2011 –	Member, American Statistical Association (ASA)
2011 –	Member, International Biometric Society (ENAR)
2017 –	Member, American Association for the Advancement of Science

Honors

1999	Travel grant for CBMS Summer Course on Inferences From Genetic Data & On Pedigrees, Michigan Technical University
2001	New Investigator Research Award, College of Public Health-College of Medicine, University of Iowa
2002	Travel grant for Workshop on Developments and Challenges in Mixture Models, Bump Hunting and Measurement Error Models, Case Western Reserve University
2002	Travel grant for Frontiers of Statistical Research: A Celebration of the 40th Anniversary of the Department of Statistics at Texas A&M University, Texas A&M University

C. Contributions to Science

1. With the rapid development of high throughput biological technology, unprecedented amount of data are available for gene mapping studies. Such data raise new challenges to statistical analysis. I have developed new statistical methods for multipoint genetic linkage analysis, robust statistics for genetic association analysis, gene-based association methods, and high-dimensional data analysis.
 - a. Wang K. Boosting the Power of the Sequence Kernel Association Test by Properly Estimating Its Null Distribution. *Am J Hum Genet.* 2016 Jul 7;99(1):104-14. PubMed PMID: [27292111](#); PubMed Central PMCID: [PMC5005443](#).
 - b. Huang J, Wang K, Wei P, Liu X, Liu X, Tan K, Boerwinkle E, Potash JB, Han S. FLAGS: A Flexible and Adaptive Association Test for Gene Sets Using Summary Statistics. *Genetics.* 2016 Mar;202(3):919-29. PubMed PMID: [26773050](#); PubMed Central PMCID: [PMC4788129](#).

- c. Wang K, Abbott D. A principal components regression approach to multilocus genetic association studies. *Genet Epidemiol.* 2008 Feb;32(2):108-18. PubMed PMID: [17849491](#).
 - d. Wang K, Sheffield VC. A constrained-likelihood approach to marker-trait association studies. *Am J Hum Genet.* 2005 Nov;77(5):768-80. PubMed PMID: [16252237](#); PubMed Central PMCID: [PMC1271386](#).
2. Polychlorinated biphenyls (PCB) is a large family of environmental pollutants that cause many different types of adverse human health effects including cancer. I have been serving the role of statistician for the Iowa Superfund Research Program for 9 years. Our research results are essential for risk assessment, development of strategies to prevent or ameliorate toxicity, and for management of these toxicants in human environments.
- a. Wang B, Klaren WD, Wels BR, Simmons DL, Olivier AK, Wang K, Robertson LW, Ludewig G. Dietary Manganese Modulates PCB126 Toxicity, Metal Status, and MnSOD in the Rat. *Toxicol Sci.* 2016 Mar;150(1):15-26. PubMed PMID: [26660635](#); PubMed Central PMCID: [PMC5009614](#).
 - b. Koh WX, Hornbuckle KC, Marek RF, Wang K, Thorne PS. Hydroxylated polychlorinated biphenyls in human sera from adolescents and their mothers living in two U.S. Midwestern communities. *Chemosphere.* 2016 Mar;147:389-95. PubMed PMID: [26774304](#); PubMed Central PMCID: [PMC4747419](#).
 - c. Lai IK, Klaren WD, Li M, Wels B, Simmons DL, Olivier AK, Haschek WM, Wang K, Ludewig G, Robertson LW. Does dietary copper supplementation enhance or diminish PCB126 toxicity in the rodent liver?. *Chem Res Toxicol.* 2013 May 20;26(5):634-44. PubMed PMID: [23527585](#); PubMed Central PMCID: [PMC3660509](#).
 - d. Marek RF, Thorne PS, Wang K, Dewall J, Hornbuckle KC. PCBs and OH-PCBs in serum from children and mothers in urban and rural U.S. communities. *Environ Sci Technol.* 2013 Apr 2;47(7):3353-61. PubMed PMID: [23452180](#); PubMed Central PMCID: [PMC3645264](#).
3. Primary open angle glaucoma (POAG) and age-related macular degeneration are leading causes of blindness worldwide. I have been involved in genetic analysis on these two phenotypes for more than 10 years. Our studies has made a number of findings, including novel mutations in ABCA4 gene. These findings are being used for genetic testing at the The Stephen A. Wynn Institute for Vision Research at the University of Iowa
- a. Hedberg-Buenz A, Christopher MA, Lewis CJ, Fernandes KA, Dutca LM, Wang K, Scheetz TE, Abramoff MD, Libby RT, Garvin MK, Anderson MG. Quantitative measurement of retinal ganglion cell populations via histology-based random forest classification. *Exp Eye Res.* 2016 May;146:370-85. PubMed PMID: [26474494](#); PubMed Central PMCID: [PMC4841761](#).
 - b. Stunkel M, Bhattarai S, Kemerley A, Stone EM, Wang K, Mullins RF, Drack AV. Vitritis in pediatric genetic retinal disorders. *Ophthalmology.* 2015 Jan;122(1):192-9. PubMed PMID: [25217415](#); PubMed Central PMCID: [PMC4277925](#).
 - c. Sohn EH, Wang K, Thompson S, Riker MJ, Hoffmann JM, Stone EM, Mullins RF. Comparison of drusen and modifying genes in autosomal dominant radial drusen and age-related macular degeneration. *Retina.* 2015 Jan;35(1):48-57. PubMed PMID: [25077532](#).
 - d. Mullins RF, Schoo DP, Sohn EH, Flamme-Wiese MJ, Workamelahu G, Johnston RM, Wang K, Tucker BA, Stone EM. The membrane attack complex in aging human choriocapillaris: relationship to macular degeneration and choroidal thinning. *Am J Pathol.* 2014 Nov;184(11):3142-53. PubMed PMID: [25204844](#); PubMed Central PMCID: [PMC4215023](#).
4. Many blood disorders are due to genetics. I have conducted genetic analysis on a number projects related to blood disorders. These studies lead to a finding that mutations in NBEAL2 gene associated with gray platelet syndrome, a confirmation of 3p21 as a recessive locus for gray platelet syndrome, and some novel candidate loci for erythrocyte traits.
- a. Fabbro S, Kahr WH, Hinckley J, Wang K, Moseley J, Ryu GY, Nixon B, White JG, Bair T, Schutte B, Di Paola J. Homozygosity mapping with SNP arrays confirms 3p21 as a recessive locus for gray platelet

syndrome and narrows the interval significantly. *Blood*. 2011 Mar 24;117(12):3430-4. PubMed PMID: [21263149](#); PubMed Central PMCID: [PMC3069679](#).

- b. Kahr WH, Hinckley J, Li L, Schwertz H, Christensen H, Rowley JW, Pluthero FG, Urban D, Fabbro S, Nixon B, Gadzinski R, Storck M, Wang K, Ryu GY, Jobe SM, Schutte BC, Moseley J, Loughran NB, Parkinson J, Weyrich AS, Di Paola J. Mutations in NBEAL2, encoding a BEACH protein, cause gray platelet syndrome. *Nat Genet*. 2011 Jul 17;43(8):738-40. PubMed PMID: [21765413](#).
 - c. Hinckley JD, Abbott D, Burns TL, Heiman M, Shapiro AD, Wang K, Di Paola J. Quantitative trait locus linkage analysis in a large Amish pedigree identifies novel candidate loci for erythrocyte traits. *Mol Genet Genomic Med*. 2013 Sep 1;1(3):131-141. PubMed PMID: [24058921](#); PubMed Central PMCID: [PMC3775389](#).
 - d. Gonzalez-Alegre P, Di Paola J, Wang K, Fabbro S, Yu HC, Shaikh TH, Darbro BW, Bassuk AG. Evaluating Familial Essential Tremor with Novel Genetic Approaches: Is it a Genotyping or Phenotyping Issue?. *Tremor Other Hyperkinet Mov (N Y)*. 2014 Oct 20;4:258. PubMed PMID: [25374765](#); PubMed Central PMCID: [PMC4219111](#).
5. I have been participating in a number of other projects. These projects include studies on Bardet-Biedl Syndrome, cystic fibrosis, atypical hemolytic uremic syndrome, idiopathic scoliosis, and epigenetic markers for smoking.
- a. Mondal P, Baumstein S, Prabhakaran S, Abu-Hasan M, Zeng Y, Singh S, Wang K, Ahrens RC, Hendeles L. Bioassay of salmeterol in children using methacholine challenge with impulse oscillometry. *Pediatr Pulmonol*. 2016 Jun;51(6):570-5. PubMed PMID: [26575323](#).
 - b. Fisher JT, Tyler SR, Zhang Y, Lee BJ, Liu X, Sun X, Sui H, Liang B, Luo M, Xie W, Yi Y, Zhou W, Song Y, Keiser N, Wang K, de Jonge HR, Engelhardt JF. Bioelectric characterization of epithelia from neonatal CFTR knockout ferrets. *Am J Respir Cell Mol Biol*. 2013 Nov;49(5):837-44. PubMed PMID: [23782101](#); PubMed Central PMCID: [PMC3931095](#).
 - c. Seo S, Mullins RF, Dumitrescu AV, Bhattarai S, Gratie D, Wang K, Stone EM, Sheffield V, Drack AV. Subretinal gene therapy of mice with Bardet-Biedl syndrome type 1. *Invest Ophthalmol Vis Sci*. 2013 Sep 11;54(9):6118-32. PubMed PMID: [23900607](#); PubMed Central PMCID: [PMC3771708](#).
 - d. Gonzalez-Alegre P, Buffard V, Wang K, Henien S, Morcuende JA. Exploring the link between dystonia genes and idiopathic scoliosis. *J Pediatr Orthop*. 2013 Sep;33(6):e65-6. PubMed PMID: [23812140](#).

Complete List of Published Work in My Bibliography:

<http://bit.ly/2iDnWMw>

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

R01 EY026087 (Stone, Ed, PI) 09/01/2016-08/31/2020

NIH
Unraveling the 10q AMD Risk Locus
In this study, we will take advantage of molecular genetics, state of the art computer-assisted image analysis, large patient populations, donor eye tissue, induced pluripotent stem cells and CRISPR based genome editing to determine the molecular mechanism through which variations at the 10q AMD locus increase the risk of AMD.

Role: Co-Investigator

P30 ES005605 (Thorne, Peter, PI) 09/29/1990-03/31/2022

NIH
Environmental Health Sciences Research Center

Building on a 26-year history, the Environmental Health Sciences Research Center (EHSRC) will advance and translate cutting edge research that addresses environmental health problems across the urban-rural continuum. The EHSRC vision is to be the primary environmental health sciences (EHS) resource for improving the health of rural residents by stimulating and translating innovative EHS research. Center goals are to: 1) Develop, support and expand innovative interdisciplinary EHS research in key Thematic Areas; 2) Recruit, mentor and nurture talented new and mid-level investigators in EHS; and 3) Engage with communities and policy makers to translate research findings toward improving the health and environment of rural people in the Midwest and the nation.

Role: Co-Investigator

LARSON18A0 (Larson Ode, Katie, PI) 09/01/2018-08/31/2021

Cystic Fibrosis Foundation

EnVision CF Multicenter Study of Glucose Tolerance in Cystic Fibrosis

Cystic Fibrosis Related Diabetes (CFRD) has been identified by the cystic fibrosis (CF) community as one of the top ten priorities for CF research. We know that high blood sugars caused by not enough insulin lead to worse lung function in CF even before diabetes develops. However, we do not know which people with abnormal blood sugars will have long term problems. In our study, we will obtain blood sugar levels, insulin (the hormone that controls blood sugar) and C-peptide (a protein that tells us about the body's ability to make insulin) levels from frequently-sampled Oral Glucose Tolerance Testing (fsOGTT). We will save all the extra blood from the fsOGTT tests to make a biobank (a bank of stored blood samples) which can be used for future studies to better understand diabetes and abnormal blood sugar in CF.

Role: Biostatistician

5 P42 ES013661 (Hornbuckle, Keri PI) 05/12/2006-01/31/25

NIH/NIEHS

Semi-Volatile PCBs: Sources, Exposures, Toxicities (Superfund Research Program Administrative Core)

This is the technology transfer administrative supplement for the Superfund Research Program and provides administrative oversight, statistical consulting, research results reporting, and serves as a liaison between the stakeholders, University officials, and the SRP.

Role: Co-Investigator

R21 ES027169 (Lehmler, Hans-Joachim, PI) 09/01/2017-08/31/2020

NIH

PCB Enantiomers Implicated in Neurodevelopmental Disorders: Identification of Individual Metabolic Factors that Determine Risk and Vulnerability

The long-term goal of this project is to determine how inter-individual differences in enantioselective PCB metabolism affect the susceptibility to PCB-mediated neurodevelopmental disorders following environmental exposures and, ultimately, reduce the burden of these diseases.

Role: Co-Investigator

06910/5 U54 OH009568 (Rohlman, Diane, PI) 09/30/2014-09/29/2020

Marshfield Clinic Research Institute/CDC

National Center of Excellence for the Prevention of Childhood Agricultural Injury

Dr. Diane Rohlman and Dr. Shelly Campo will work as co-PIs to provide the overall leadership of this project.

Dr. Rohlman will serve as contact PI for the project and will assume fiscal and administrative management, including maintaining communication among PIs and key personnel through weekly meetings. She will be responsible for the communication with NIOSH and submission of annual reports. Working with Dr. Campo, she will coordinate all study aspects, including human subject (IRB) submissions, all survey and field activities, quality assurance of training, data analysis and she will prepare all scientific and technical reports. Dr. Rohlman will take the lead on the safety content and model policies and programming the online training in cTRAIN. She will also work with the partners to recruit agricultural employers for participation in the evaluation and dissemination of the training. Dr. Campo will take the lead on developing the health promotion content, building self-efficacy skills of supervisors to talk to their employees proactively and the development of questionnaires.

Role: Co-Investigator

R01 ES031098 (Lehmle, Hans-Joachim, PI) 02/01/2020-11/20/2024

NIH
PCB-Mediated Dysbiosis of the Gut Microbiome: A Missing Link in PCB-Mediated Neurodevelopmental Disorders?
Exposure of the developing brain to polychlorinated biphenyls (PCBs) and disruption of the gut microbiome have independently been implicated in the etiology of neurodevelopmental disorders (NDDs). The anticipated outcome of our studies is a new research paradigm demonstrating that developmental exposures to PCBs mediate (1) longitudinal changes in gut microbiome composition and function and (2) alter PCB disposition in the developing brain that influence neurodevelopmental outcomes later in life.
Role: Co-Investigator

Completed Research:

R01 ES022163 (Rohlman, Diane) 03/04/2013-10/31/2019

NIH
Vulnerability of the Adolescent Brain to Organophosphorus Pesticides
Despite evidence from human and animal studies that clearly identifies neurotoxicity as the primary adverse endpoint, the long-term effects of repeated occupational and environmental exposures to organophosphorus pesticides (OPs) remain poorly understood. There is also a critical need to investigate the susceptibility of children and adolescents to pesticides, since the developing brain may be uniquely sensitive to the neurotoxic effects of these agents. We propose a longitudinal study to investigate the relationship between sensitive and specific biomarkers of pesticide exposure, effect and susceptibility and multiple measures of neurobehavioral function in this unique cohort over a 5-year period to assess cumulative and potentially reversible effects.
Role: Co-Investigator

R21 HD091458 (Bao, Wei) 07/10/2017-06/30/2020

NIH
Pregnancy-Associated microRNAs in Plasma as Predictors of Gestational Diabetes
Role: Co-Investigator