

Molecular epidemiology of cancer susceptibility, pharmacogenetics, genomics, personalized medicine, and functional genomics. Our research in molecular epidemiology identifies individuals genetically susceptible to the development of cancer from environmental and occupational chemicals in order to focus treatment and prevention public health strategies on those at greatest risk. Our research in pharmacogenetics/genomics and personalized medicine improves our understanding of the genetic causes for drug failure and/or drug toxicity in order to optimize clinical drug therapy for each individual patient. Our research in functional genomics improves understanding of the mechanistic and clinical consequences of genetic variation in the biotransformation of carcinogens and drugs. Serves as director of funded training programs in environmental health sciences and cancer for pre-doctoral, post-doctoral, undergraduate and professional students.

## Grants

Title: UofL Environmental Health Sciences Training Program  
Role in Project: Principal Investigator  
Funding Agency: NIH/NIEHS (T32- ES011564)  
Project Period: July 1, 2009 to June 30, 2014  
Project Award: \$2,037,745 (total)

Title: University of Louisville Cancer Education Program  
Role in Project: Principal Investigator  
Funding Agency: NIH/NCI (R25- CA134283)  
Project Period: September 14, 2011 to August 31, 2016  
Project Award: \$1,543,610 (total)

Title: Summer Environmental Health Sciences Training Program  
Principal Investigator: Drs. Prabhu, Prough, and Srivastava (University of Louisville)  
Funding Agency: NIEHS (T35- ES014559)  
Role in Project: Mentor  
Project Period: April 1, 2011 to March 31, 2016  
Project Award: \$175,814 (total)

Title: Study of Candidate Xenobiotic Metabolism Genes and Renal Cancer  
Role in Project: Principal Investigator  
Funding Agency: National Cancer Institute (Contract HHSN261201100383P)  
Project Period: September 1, 2011 to August 30, 2012  
Project Award: \$7,913 (total)

Title: Center for Environmental Genomics and Integrative Biology  
Principal Investigator: Kenneth Ramos (University of Louisville)  
Funding Agency: NIH (P30-ES014443)  
Role in Project: Center Investigator  
Project Period: June 4, 2007 to March 31, 2012  
Project Award: \$4,440,000 (total)

Title: N-acetyltransferase 1 Polymorphism and Breast Cancer Risk  
Principal Investigator: Lori Millner (University of Louisville)  
Funding Agency: BC083107 Department of Defense Breast Cancer Research Program  
Role in Project: Mentor  
Project Period: September 29, 2008 to September 28, 2011  
Project Award: \$92,442 (total)

Title: Understanding and predicting individual cancer risk  
Role in Project: Principal Investigator  
Funding Agency: UofL Clinical & Translational Science Pilot Grant Program  
Project Period: June 1, 2010 to May 31, 2011  
Project Award: \$50,000 (total)

Title: Summer Environmental Health Sciences Training Program  
Principal Investigator: Russell A. Prough (University of Louisville)  
Funding Agency: NIEHS (T35- ES014559)  
Role in Project: Mentor  
Project Period: April 1, 2006 to March 31, 2011  
Project Award: \$158,355 (total)

## Publications

\*Hein, D.W. and Grant, D.M.: Pharmacogenetics and Pharmacogenomics (Chapter 4). In: Pharmacology and Therapeutics for Dentistry, Sixth Edition, Yagiela, J.A., Dowd, F.J., Johnson, B., Mariotti, A., and Neidle, E.A., editors, pp. 69-76, Elsevier Mosby, St. Louis, 2011. (ISBN: 978-0-323-05593-2).

\*Hein, D.W., Waite, L.C. and Waddell, W.J.: Toxicology milestones at the Department of Pharmacology and Toxicology, University of Louisville. In: Building for the Future: Toxicology Training Centers, pp. 70-73, Society of Toxicology, Reston, Virginia, 2011.

Garcia-Closas, M., Hein, D.W., Silverman, D., Malats, N., Yeager, M., Jacobs, K., Doll, M.A., Figueroa, J.D., Baris, D., Schwenn, M., Kogevinas, M., Johnson, A., Chatterjee, N., Moore, L.E., Moeller, T., Real, F.X., Chanock, S. and Rothman, N.: A single nucleotide polymorphism tags variation in the arylamine N-acetyltransferase 2 phenotype in populations of European background. *Pharmacogenetics and Genomics* 21: 231-236, 2011. (Epub August 25, 2010). (PubMed) [PMCID: PMC3003749]

Kidd, L.R., Hein, D.W., Woodson, K., Taylor, P.R., Albanes, D., Virtamo, J., and Tangrea, J.A.: Lack of association of N-acetyltransferase NAT1\*10 allele with prostate cancer incidence, grade, or stage among smokers in Finland. *Biochemical Genetics* 49: 73-82, 2011. (Epub October 8, 2010). (PubMed) [PMCID: PMC3155982]

Moore, L.E., Baris, D.R., Figueroa, J.D., Garcia-Closas, M., Karagas, M.R., Schwenn, M.R., Johnson, A.T., Lubin, J.H., Hein, D.W., Dagnall, C.L., Colt, J.S., Kida, M., Jones, M.A., Schned, A.R., Cherala, S.S., Chanock, S.J., Cantor, K.P., Silverman, D.T., and Rothman, N.: GSTM1 null and NAT2 slow acetylation genotypes, smoking intensity, and bladder cancer risk: Results from the New England bladder cancer case-control study and NAT2 meta-analysis. *Carcinogenesis* 32: 182-189, 2011. (Epub October 29, 2010). (PubMed) [PMCID: PMC3026839]

Zhu, Y., States, J.C., Wang, Y., and Hein, D.W.: Functional effects of genetic polymorphisms in the N-acetyltransferase 1 coding and 3' untranslated regions. *Birth Defects Research (Part A): Clinical and Molecular Teratology* 91: 77-84, 2011. (Epub February 2). (PubMed) [PMCID: PMC3252750]



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Kidd, L., VanCleave, T.T., Doll, M.A., Srivastava, D.S., Thacker, B., Komolafe, O., Phiur, V., Brock G.N. and Hein, D.W.: No association between variant N-acetyltransferase genes, cigarette smoking and prostate cancer susceptibility among men of African descent. *Biomarkers in Cancer* 3: 1-13, 2011. (PubMed) [PMCID: PMC3122269]

Koutros, S., Silverman, D.T., Baris, D., Zahm, S.H., Morton, L.M., Colt, J.S., Hein, D.W., Moore, L.E., Johnson, A., Schwenn, M., Cherala, S., Schned, A., Doll, M.A., Rothman, N., and Karagas, M.R.: Hair dye use and risk of bladder cancer in the New England bladder cancer study. *International Journal of Cancer* 129: 2894-2904, 2011. (Epub June 15). (PubMed) [PMCID: PMC3203248]

Millner, L.M., Doll, M.A., Cai, J., States, J.C. and Hein, D.W.: NATb/NAT1\*4 promotes greater N-acetyltransferase 1 mediated DNA adducts and mutations than NATa/NAT1\*4 following exposure to 4-aminobiphenyl. *Molecular Carcinogenesis* 51: 636-646, 2012. (Epub August 11, 2011). (PubMed) [PMCID: PMC3217153]

Millner, L.M., Doll, M.A., Cai, J., States, J.C., and Hein, D.W.: Phenotype of the most common "slow acetylator" arylamine N-acetyltransferase 1 genetic variant (NAT1\*14B) is substrate- dependent. *Drug Metabolism and Disposition* 40: 198-204, 2012. (Epub October 18, 2011). (PubMed) [PMCID: PMC3250052]

Hein, D.W. and Doll, M.A.: Accuracy of various human NAT2 SNP genotyping panels to infer rapid, intermediate, and slow acetylator phenotypes. *Pharmacogenomics* 13: 31-41, 2012. (Epub November 17, 2011). (PubMed) [PMCID: PMC3285565]

Millner, L.M., Doll, M.A., Stepp, M.W., States, J.C., and Hein, D.W.: Functional analysis of arylamine N-acetyltransferase 1 (NAT1) NAT1\*10 haplotypes in a complete NATb mRNA construct. *Carcinogenesis* 33: 348-355, 2012. (Epub November 22, 2011). (PubMed) [PMCID: PMC3271262]

Sugamori, K.S., Brenneman, D., Sanchez, O., Doll, M.A., Hein, D.W., Pierce, W.M., Jr., and Grant, D.M.: Reduced 4-aminobiphenyl-induced liver tumorigenicity but not DNA damage in arylamine N-acetyltransferase null mice. *Cancer Letters* 318: 206-213, 2012. (Epub December 19, 2011). (PubMed) [PMCID: PMC3303986]

Potts, L.F., Cambon, A.C., Ross, O.A., Rademakers, R., Dickson, D.W., Uitti, R.J., Wszolek, Z.W., Rai, S.N., Farrer, M.J., Hein, D.W., and Litvan, I.: Polymorphic genes of detoxication and mitochondrial enzymes and risk factors for progressive supranuclear palsy: A case control study. *BMC Medical Genetics* 13: 16, 2012. (PubMed) [PMCID: PMC3340705]

Lavender, N.A., Rogers, E.N., Yeyeodu, S., Rudd, J., Hu, T., Zhang, J., Brock, G.N., Kimbro, K.S., Moore, J.H., Hein, D.W., and Kidd, L.R.: Interaction among apoptosis-associated sequence variants and joint effects on aggressive prostate cancer. *BMC Medical Genomics* 5: 11, 2012. (PubMed) [PMCID: PMC3355002]

Hein, D.W. and Doll, M.A.: A four-SNP NAT2 genotyping panel recommended to infer human acetylator phenotype. *Pharmacogenomics* 13: 855, 2012.  
Fu, Z., Shrubsole, M.J., Li, G., Smalley, W.E., Hein, D.W., Chen, Z., Shy, Y., Cai, Q., Ness, R.M., and Zheng, W.: Using gene-environmental interaction analyses to clarify the role of well-done meat and heterocyclic amine exposure in the etiology of colorectal polyps. *American Journal of Clinical Nutrition* 96: 1119-1128, 2012. (Epub September 26). (PubMed) [PMCID: PMC3471199]

Gibson, T.M., Smedby, K.E., Skibola, C.F., Hein, D.W., Slager, S.L., De Sanjose, S., Vajdic, C.M., Zhang, Y., Chiu, B.C., Wang, S.S., Hjalgrim H., Nieters, A., Bracci, P.M., Krickler, A., Zheng, T., Kolar, C., Cerhan, J.R., Darabi, H., Becker, N., Conde, L., Holford, T.R., Weisenberger, D.D., De Roos, A.J., Butterbach, K., Riby, J., Cozen, W., Benavente, Y., Palmers, C., Holly, E.A., Sampson, J.N., Rothman, N., Armstrong, B.K., and Morton, L.M.: Smoking, variation in N-acetyltransferase 1 (NAT1) and 2 (NAT2), and risk of non-Hodgkin lymphoma: a pooled analysis within the InterLymph consortium. *Cancer Causes and Control* 24: 125-134, 2013. (Epub November 18, 2012) [PMCID: PMC3529854]

Fu, Z., Shrubsole, M.J., Li, G., Smalley, W.E., Hein, D.W., Cai, Q., Ness, R.M., and Zheng, W.: Interaction of cigarette smoking and carcinogen-metabolizing polymorphisms in the risk of colorectal polyps. *Carcinogenesis* 34: 779-786, 2013. (Epub January 8).

## External Professional Activities

- Chair, International Arylamine N-acetyltransferase Gene Nomenclature Committee
- Consultant, Procter & Gamble, Inc.
- Consultant, L'Oreal, Inc.
- Member, NIEHS grant review committee
- Reviewer, Pennsylvania Department of Health grants
- Member, Editorial Board for the following journals: *Pharmacogenomics*; *Journal of Ovarian Research*; *World Journal of Clinical Oncology*; *World Journal of Medical Genetics*; *World Journal of Pharmacology*; *Acta Pharmaceutica Sinica B*; *The Scientific World Journal*; *World Journal of Translational Medicine*