

Elizabeth Hare PhD
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Employment

Quantitative Geneticist and Owner, Dog Genetics LLC, Sunnyside, NY (2010-present)

Transportation Security Administration Canine Breeding and Development Center

- Estimated heritabilities and breeding values of search-related behavior traits (using R and MTDFREML)
- Implemented a selection index containing priority traits and estimated breeding values to identify dogs to use as parents for future generations (using R)
- Demonstrated success of selective breeding by improvements in average estimated breeding values for behavior traits and PennHip score.
- Collected high-density genome-wide SNP markers on an unprecedentedly large family of dogs; performed quality control on data (using PLINK, PEDSTATS and R)
- Linkage analysis of entire population (using SOLAR)

Leader Dogs for the Blind

- Cleaned and prepared data for analysis (R)
- Estimated heritabilities and breeding values for health and behavior traits using MTDFREML for quantitative traits and ASRML or R/MCMCglmm for binary traits
- Collaborated with Breeding Manager to establish and implement a selection index reflecting the priorities of the breeding program for each breed calculated using (R)
- Taught Breeding Manager the processes of data cleaning, heritability and breeding value estimation, and selection index computation

Penn Vet Working Dog Center

- Provides study design advice for Center Studies
- Time-series data organization and statistical analysis for studies involving instruments that track activity, pulse, temperature and other metrics.
- Established C-BARQ personality differences between Search and Rescue Dogs and pet dogs using linear models in R
- Provides quantitative genetic analysis results to guide selective breeding
- Compared hydration methods of Customs and Border Patrol dogs using linear mixed models in R
- Organized five conferences, including *Defining, Developing, and Documenting Success in the Working Dog* (2011), *The Art & Science of Training: Dog and Handler* (2013), and *Whole Dog 360: A Multidisciplinary Approach* (2016)

Frontiers in Veterinary Science, Working Dogs Section

- Editorial Board; reviews submitted journal articles, recommends acceptance decision to editor, suggests improvements in contents and method

South Texas Psychiatric Genetics Research Center, San Antonio, TX

Assistant Professor, Texas Tech University (2010)

Research Instructor, University of Texas Health Science Center San Antonio, (2008-2010)

Postdoctoral Fellow, University of Texas Health Science Center San Antonio, (2006-2008)

Cleaned and organized pedigree and trait data (R, SAS, PEDSTATS, simwalk2, PREST)
Identified a genetic region linked with schizophrenia using linkage analysis (MERLIN)

- Estimated heritability of age of onset in schizophrenia, and personality traits in families affected with bipolar disorder (SOLAR).
- Taught faculty, residents and students to formulate research questions and use statistics to answer their questions. Provided statistical analysis for publications on substance use in bipolar disorder (SAS, R)

Research Geneticist, Animal Improvement Programs Laboratory, USDA, Beltsville, MD (2002 - 2004)

- Defined phenotypic trends for longevity in U.S. dairy cattle (SAS)
- Measured duration of herd participation in U.S. dairy testing program (SAS)
- Calculated calving ages and intervals for U.S. dairy breeds (SAS)

Research Associate, Animal Breeding and Genetics Group, Cornell University, Ithaca, NY (1998 - 2002)

- Developed and taught online distance education classes in Canine and Feline Genetics
- Built and indexed extensive database of canine genetics literature
- Initiated class discussions and answered students' questions
- Estimated heritability of blood catalase levels in Dutch Belted rabbits
- Determined the effect of day length on semen output and hormone concentrations in rams

Education

PhD, Genetics, George Washington University, Washington, DC (1993 - 1998)

- Awarded University Fellowship annually, 1993 - 1997
- Dissertation: *Estimation of heritability of litter size in Labrador Retrievers and German Shepherd Dogs*. Advisor: Dr. Eldin A. Leighton, Director of Canine Genetics, The Seeing Eye, Inc., Morristown, NJ.

BA, Biology, Bryn Mawr College, Bryn Mawr, PA (1988 - 1991)

Publications

Otto C, Hare E, Nord JL, Palermo SM, Kelsey KM, Darling TA, Schmidt K, Coleman D. (2017) Evaluation of three hydration strategies in detection dogs working in a hot environment. *Front Vet Sci* 4:174.

Contreras J, Hare E, Chavarria G, Raventos H. (2017) Genome-wide QTL analysis for anxiety in bipolar disorder type I. *J Affect Disord*, in press.

Contreras J, Hare E, Chavarria G, Raventos H. (2017) Quantitative Genetic Analysis of anxiety trait in bipolar disorder. *J Affect Disord* 225:395-398. PMID: 28850853.

Legge CH, Lopez A, Hanna P, Cote E, Hare E, Martinson SA. (2013) Histological characterization of dilated cardiomyopathy in the juvenile Toy Manchester Terrier. *Vet Pathol* 50:1043-1052. PMID: 23456967.

Hare E, Contreras J, Raventos H, Flores D, Jerez A, Nicolini H, Ontiveros A, Almasy L, Escamilla M. (2011) Genetic structure of personality factors and bipolar disorder in families segregating bipolar disorder. *J Affect Disord* 136:1027-1033. PMID: 21903278.

Contreras J, Hare E, Escamilla M, Raventos H. (2011) Principal domains of quantitative anxiety trait in subjects with lifetime history of mania. *J Affect Disord* 136:e69-75. PMID: 21774991.

Contreras J, Hare E, Pacheco A, Escamilla M, Raventos H. (2010) Is subclinical anxiety an endophenotype for bipolar I patients? A study from a Costa Rican sample. *J Affect Disord* 122:267-272. PMID: 19733400.

Jimenez-Castro L, Hare E, Medina R, Raventos H, Nicolini H, Mendoza R, Ontiveros A, Jerez A, Munoz R. Dassori

A, Escamilla M. (2010) Substance use disorder comorbidity with schizophrenia in families of Mexican and Central American ancestry. *Schizophrenia Res* 120:87-94. PMID: 20303714.

Glahn DC, Escamilla MA, Barguil M, Hare E, Peralta JM, Kent J, Nicolini H, Raventos H, Almasly L. Neurocognitive endophenotypes for bipolar disorder identified in multiplex multigenerational families. *Arch Gen Psychiatry* 67:168-177. PMID: 20124116.

Escamilla M, Hare E, Dassori A, Ontiveros A, Nicolini H, Raventos H, Medina R, Mendoza R, Jerez A, Munoz R, Peralta JM, Almasy L. (2009) A schizophrenia gene locus on chromosome 17q21 in a new set of families of Mexican and Central American ancestry: Evidence from the NIMH Genetics of Schizophrenia in Latino Populations Study. *Am J Psychiatry* 166:442-449. PMID: 19188284.

Hare E, Glahn D, Dassori A, Raventos H, Nicolini H, Ontiveros A, Medina R, Mendoza R, Jerez A, Canive J, Munoz R, Almasy L, Escamilla M. Heritability of age of onset of psychosis in schizophrenia in patients of Latino Ancestry. *Am J Med Genet Part B* 153:298-302. PMID: 19350535.

Arya R, Hare E, del Rincon I, Jenkinson CP, Duggirala R, Almasy L, Escalante A. (2009) Effects of covariates and interactions on genome-wide association analysis of rheumatoid arthritis. *BMC Proc* 3 (Suppl 7):S84. PMID: 20018080.

Ng NYM, Levinson DF, Faraone SV, Suarez BK, DeLisi LE, Arinami T, Riley B, Paunio T, Pulver AE, Irmansyah, Holmans PA, Escamilla MA, Wildenauer DB, Williams NM, Laurent C, Mowry BJ, Brzustowicz L, Maziade M, Sklar P, Garver DL, Abecasis G, Lerer B, Fallin MD, Gurling HMD, Gejman PV, Lindholm E, Moises H, Byerley W, Wijsman EM, Forabosco P, Tsuang MT, Hwu H-G, Okazaki Y, Kendler KS, Wormley B, Fanous A, Walsh B, O'Neill A, Peltonen L, Nestadt G, Lasseter VK, Liang KY, Papadimitriou G, Dikeos D, Schwab SG, Owen SJ, O'Donovan MC, Norton N, Hare E, Raventos H, Nicolini H, Albus M, Maier W, Nimgaonkar VL, Terenius L, Mallet J, Jay M, Godard S, Nertney D, Alexander M, Crowe RR, Silverman JM, Bassett AS, Roy M-A, Merette C, Pato CN, Pato MT, Louw Roos J, Kohn Y, Amann-Zalcenstein D, Kalsi G, McQuillin A, Curtis D, Brynjolfson J, Sigmundsson T, Petursson H, Sanders AR, Duan J, Jazin E, Myles-Worsley M, Karayiorgou M, Lewis CM. (2008) Meta-analysis of 32 genomewide linkage studies of schizophrenia. *Molecular Psychiatry* 14:774-785. PMID: 19349958.

Contreras-Rojas J, Camarena B, Glahn DC, Dassori A, Medina R, Contreras S, Ramirez M, Armas R, Munoz R, Mendoza R, Raventos H, Ontiveros A, Nicolini H, Escamilla M. (2008) The serotonin transporter 5-HTTPR polymorphism is associated with current and lifetime depression in persons with chronic psychotic disorders. *Acta Psychiatr Scand* 119:117-127. PMID: 19016667.

Almasy L, Gur RC, Haack K, Cole SA, Calkins ME, Peralta JM, Hare E, Prasad K, Pogue-Geile MF, Nimgaonkar V, Gur RE. (2008) A genome screen for QTL s influencing schizophrenia and neurocognitive phenotypes. *Am J Psychiatry* 165:1185-1192. PMID: 18628350.

Chavarria-Siles I, Contreras-Rojas J, Hare E, Walss-Bass C, Quezada P, Dassori A, Contreras S, Ramirez M, Salazar R, Raventos H, Escamilla MA. (2008) Cannabinoid Receptor 1 Gene (CNR1) and susceptibility to hebephrenic schizophrenia in the Costa Rican population. *Am J Med Genet Part B* 147:279-284. PMID: 18186055.

Alkelai A, Crowley J, DasBanerjee T, Docherty S, Hare E, Galsworthy MJ, Grover D, Grubb D, Karlsson R, Mill J, Sen S, Quinones MP, Vallender E, Verma R, Vijayan NN, Villafuerte S, Voineskos AN, Volk H, Yu L, Zimmerman P, DeLisi LE, et al. (2008) The XVth World Congress of Psychiatric Genetics, October 7-11, 2007: Rapporteur summaries of oral presentations. *Am J Med Genet Part B* 147:233-277. PMID: 18297693.

Hare E, Leighton EA. (2006) Estimation of heritability of litter size in Labrador Retrievers and German Shepherd Dogs. *J Vet Behav: Clin App Res* 1:62-66.

Hare E, Norman HD, Wright JR. (2006) Survival Rates and Herd Life of Dairy Cattle in the United States. *J Dairy Sci* 89:365-370. PMID: 16899708.

Hare E, Norman HD, Wright JR. (2006) Trends in Calving Ages and Calving Intervals for Dairy Cattle Breeds in the United States. *J Dairy Sci* 89:365-370. PMID: 16357301.

Norman HD, Hare E. (2005) Historical examination of culling of dairy cows from herds in the United States. *J Dairy Sci*. 88(Suppl. 1): 122 (abstr. 203).

Hare E. (2005) Estimation of heritability of litter size in Labrador Retrievers and German Shepherd Dogs at the Seeing Eye, Inc. Proceedings of the 2005 International Working Dog Breeders' Association Conference, Melbourne, Australia.

Hare E, Norman HD, Wright JR. (2003) Duration of herd participation in dairy herd improvement milk recording in the United States. *J Dairy Sci* 87:2743-2747. PMID: 15328300.

Foote RH, Hare E. (2001) Catalase and hematocrit values of related young and mature male and female Dutch-belted rabbits. *Laboratory Animals* 35:140-146. PMID: 11315162.

El-Alamy MA, Foote RH, Hare E. (2001) Sperm output and hormone concentrations in Finn and Dorset rams exposed to long and short day lighting. *Theriogenology* 56: 839-854. PMID: 11665886.

Foote RH, Hare E. (2000) High catalase content of rabbit semen appears to be inherited. *J Andrology* 21:664-668. PMID: 10975413.