BIOGRAPHICAL SKETCH

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NAME: Zeisel, Steven H.

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

POSITION TITLE: Professor of Nutrition

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
Harvard Medical School , Boston, MA	MD	06/1975	Medicine
Yale-New Haven Hospital, New Haven, CT	Resident	06/1977	Pediatrics
Massachusetts Institute of Technology, Cambridge, MA	PhD	06/1980	Nutrition
Children's Hospital, Boston, MA	Fellow	06/1981	Human Nutrition
Massachusetts Institute of Technology, Cambridge, MA	Postdoc	06/1981	Neurochemistry

A. Personal Statement

Dr. Steven Zeisel is a leader in the development of the field of precision nutrition. His research team has identified single nucleotide polymorphisms (SNPs) that alter the nutrition requirements for choline, an essential nutrient. This includes identification of a common SNP that modifies the estrogen response element in the gene *PEMT* that reduces capacity for de novo biosynthesis of phosphatidylcholine, SNPs in the choline transporter and in choline kinase, that increase rhabdomyolysis in people eating low choline diets. SNPs in the pathways of choline and folate metabolism that increase risk for fatty liver developing in people as they gain weight. SNPs in genes of choline metabolism that affect sperm motility by decreasing mitochondrial capacity to make ATP. Finally, Dr. Zeisel has studied how traditional diets low in choline increase evolutionary pressure to eliminate SNPs that make choline metabolism less efficient. Dr. Zeisel has authored review articles on nutrigenomics and precision nutrition and has delivered lectures on this topic at many major international meetings.

B. Positions and Honors

Positions and Employment

1982-1987 Assistant Professor, Boston University School of Medicine, Boston, MA
1987-1990 Associate Professor, Boston University School of Medicine, Boston, MA
1990-1990 Professor, Departments of Pathology and Pediatrics, Boston University School of Medicine, Boston, MA
1990-2005 Professor and Chair, Department of Nutrition, School of Medicine and School of Public Health, University of North Carolina at Chapel Hill, NC
1990-present Professor, Department of Pediatrics, University of North Carolina at Chapel Hill, NC
1999-2007 Associate Dean for Research, School of Public Health, University of North Carolina at Chapel Hill, NC
2005-present Kenan Distinguished University Professor, Departments of Nutrition, University of North Carolina at Chapel Hill, NC
2006-present Director, Nutrition Research Institute, University of North Carolina at Chapel Hill, NC

Other Experiences and Professional Memberships

1987-present American Society for Nutritional Sciences: (President 2002), Long Range Planning Chair

(2003-2005), Strategic Planning Committee (2005-present)
1998-present Member, International Society for Neurochemistry
1996-1998 Panel on Recommended Dietary Intake of Folate and B-Vitamins, National Academy of Sciences
2000-2009 Chairman, NIH Integrative Nutrition and Metabolic Processes Study Section
2001-2005 FDA Food Advisory Committee, Center for Food Safety and Applied Nutrition, Dietary Supplements
2005-2008 Member, Editorial Committee, Annual Review of Nutrition
2005-present Member, Editorial Board, FASEB Journal
2010 Specialty Chief Editor, Frontiers in Nutrigenomics

Honors

1986 Future Leader Award, International Life Sciences Institute-Nutrition Foundation
1991 American College of Nutrition, Grace Goldsmith Award for Teaching and Research in Nutrition 1996-present Who's Who in America
2001 American Society for Clinical Nutrition-Dannon Institute Award for Excellence in Medical/Dental Nutrition Education
2006 Bristol-Meyers Squibb Award for Distinguished Achievement in Nutrition Research
2007 The American College of Nutrition, Award for Outstanding Achievements in Nutrition
2008 The American Society for Nutrition, Osborne and Mendel Award
2009 W.O. Atwater Lecturer-US Department of Agriculture's Agricultural Research Service
2010 Hans Falk Memorial Lecturer, National Institute of Environmental Health Sciences
2013 The Bernard G. Greenberg Alumni Endowment Award, University of North Carolina at Chapel Hill, NC

C. Contribution to Science

1. We have identified genetic polymorphisms that modify the **human dietary requirement for choline.** Many of these polymorphisms are surprisingly common – a finding that signifies wide-scale importance of our research.

    a. Kohlmeier, M., da Costa, K-A., Fischer, L., and **Zeisel, S.H.** (2005) Genetic variation of folate-mediated one-carbon transfer pathway predicts susceptibility to choline deficiency in humans. Proceedings of the National Academy of Sciences 102:16025-16030. PMCID: PMC1276051.
    b. da Costa, K-A, Corbin, K., Niculescu, M., Galanko, J., Zeisel, S.H. (2014) Identification of new genetic polymorphisms that alter the dietary requirement for choline and vary in their distribution across ethnic and racial groups. FASEB Journal. 28:2970 – 2978. PMCID: PMC4062831.
    c. Fischer, L.M., da Costa, K-A, Kwock, L., Galanko, J., **Zeisel, S.H**. (2010) Dietary choline requirements of women: effects of estrogen and genetic variation. American Journal of Clinical Nutrition. 92:1113-19. PMCID: PMC2954445.
    d. Pjetri, E., **Zeisel, S.H**. (2017) Deletion of one allele of Mthfd1 (methylenetetrahydrofolate dehydrogenase 1) impairs learning in mice. Behavioral Brain Research. 332:71-74.

2. My research team focuses on the nutrient choline and related 1-carbon metabolism. We were the first to demonstrate a human dietary requirement for choline. Our findings have had a direct impact on global nutrition policies and on interventions using choline in FASD.

    a. **Zeisel, S.H.**, da Costa, K-A., Franklin, P.D., Alexander, E.A., LaMont, T.J., Sheard, N.F., and Beiser, A. (1991) Choline is an essential nutrient for humans. FASEB Journal 5:2093-2098. PMID: 2010061.
    b. Roe, A.J., Zhang, S., Bhadelia, R.A., Johnson, E.J., Lichtenstein, A.H., Rogers, G.T., Rosenberg, I.H., Smith, C.E., Zeisel, Steven H., Scott, Tammy, M. Scott (2017) : Choline and its metabolites are differently associated with cardiometabolic risk factors, history of cardiovascular disease and MRI documented cerebrovascular disease in older adults. *American Journal of Clinical Nutrition*. 105:1283-1290. PMCID: PMC5445668.

c. Nilsson, T., Hurtig-Wennlof, A., Sjostrom, M., Herrmann, W., Obeid, R., **Zeisel, S.H.** (2015) Plasma 1carbon metabolities and academic achievement in 15-year-old adolescents. *FASEB Journal* 30:1683 – 88. PMCID: PMC4799502.
d. Wozniak, J.R., Fuglestad, A.J., Eckerle, J.K., Fink, B.A., Hoecker, H.L., Boys, C.J., Radke, J.P., Kroupina, M.G., Miller, N.C., Brearley, A.M., **Zeisel, S.H.,** Georgieff, M.K. (2015) Choline supplementation in children with Fetal Alcohol Spectrum Disorders (FASD) improves memory performance in 2-3 year-olds: A randomized, double-blind, placebo-controlled trial. *American Journal of Clinical Nutrition*. 102:1113 – 25. PMCID: PMC4625582.

3. We showed that perinatal availability of choline is important for normal brain development and function
   a. Craciunescu, C.N., Albright, C.D., Mar, M-H, Song, J., and **Zeisel, S.H.** (2003) Choline availability during embryonic development alters progenitor cell mitosis in developing mouse hippocampus. *Journal of Nutrition* 133:3614-3618. PMCID: PMC1592525.
   b. Albright, C.D., Mar, M-H., Craciunescu, C.N., Song, J., and **Zeisel, S.H.** (2005) Maternal dietary choline availability alters the balance of netrin-1 and DCC neuronal migration proteins in fetal mouse brain hippocampus. Brain Research 159:149-154. PMCID: PMC1592522.
   c. Mehedint, M.G., Craciunescu, C.N., **Zeisel, S.H.** (2010) Maternal dietary choline deficiency alters angiogenesis in fetal mouse hippocampus. Proceedings of the National Academy of Sciences USA. 107:12834-39. PMCID: PMC2919920.
   d. Wang, Y., Surzenko, N., Friday, W., Zeisel, S.H. (2015) Maternal Dietary Intake of Choline in Mice Regulates Development of the Cerebral Cortex in the Offspring. *FASEB Journal.* 30:1566 – 78. PMCID: PMC4799499.

4. We developed novel mouse models for identifying the function of choline.

   a. Johnson, A.R., Craciunescu, C.N., Guo, Z., Teng, Y-W., Thresher, R.J., Blusztajn, J.K., **Zeisel, S.H.** (2010) Deletion of murine choline dehydrogenase results in diminished sperm motility. FASEB Journal. 24:2752-61. PMCID: PMC2909292.
   b. Teng, Y-W, Mehedint, M.G., Garrow, T.A., **Zeisel, S.H.** (2011) Deletion of betaine-homocysteine Smethyltransferase in mice perturbs choline and 1-carbon metabolism, resulting in fatty liver and hepatocellular carcinoma. Journal of Biological Chemistry. 286:36258 - 67. PMCID: PMC3196139.
   c. Tsuchiya, H., da Costa, K-A, Lee, S., Renga, B., Zhang, Y., Jaeschke, H., Smalling, R., **Zeisel, S.H.**, Fiorucci, S., Wang, L. (2015) Interactions between nuclear receptor SHP and FOXA1 maintain oscillatory homocysteine homeostasis in mice. Gastroenterology. 148:1012-1023. PMCID: PMC4409521.

Complete List of Published Work in PubMed:
http://www.ncbi.nlm.nih.gov/pubmed/?term=steven+zeisel

D. Research Support

Ongoing Research Support

P30 DK056350 Zeisel (PI) 09/30/99-03/31/21
NIH/NIDDK
UNC Nutrition Obesity Research Center
The major goal of this center is to provide expertise and core services that increase and enhance conduct of human nutrition research. It is one of 12 centers of excellence funded by the NIH.
Role: Co-PI

P30 DK056530-17S1 Zeisel (PI) 04/1/17-03/31/21
NIH/NIDDK
Aggregation of core services

The major goal of this supplement is to identify NORC core services for which aggregation/standardization/ cross-validation would be of benefit to the membership of multiple NORCs and to facilitate multicenter clinical trials.

P30 DK056530-16S1 Zeisel (PI) 04/15/16-03/31/21
NIH/NIDDK
Diet supplementation with choline and brain development

R01 DK115380 Zeisel (PI) 08/12/17-11/30/21
NIH/NIDDK
Developing a biomarker panel to assess choline nutritional status
The major goal of this project is to determine the optimal set of biomarkers to use in calculating a choline status score that correlates well with choline pool size assessed using isotope dilution.

R01DK115380-02S1 Zeisel (PI) 05/21/19-04/30/21
NIH/NIDDK
Nutrigenetic analysis of choline status biomarkers

R01DK104371 Gordon-Larsen 07/01/15 – 06/30/20
NIH/NIDDK
Transition to a western diet and cardiometabolic risk: Biomarkers derived from the microbiome
The objective of the study is to understand how long-term diet and short-term diet changes, gut microbiome, gut microbiota-related metabolites, and microbiome-influenced markers of cardiometabolic disease interrelate in order to inform efforts to mitigate early development of disease risk across the globe.
Role: Co-PI

2355200005117S Zeisel (PI) 07/01/16–09/30/2019
US Department of Agriculture
Choline Content of Commonly Eaten Foods
The goal of this study is to determine the choline content of foods for a database used for nutrition studies at the US Department of Agriculture. Role: PI

Completed Research Support

R25 GM103802-01 Kohlmeier/Zeisel (Co-PIs) 09/18/12-08/31/17
NIH/NIGMS
Online Learning Platform: Introducing Clinicians and Researchers to Metabolomics
The goal of this grant is to bring metabolomics science to researchers and clinicians, preparing them to decode reports of metabolomics research and start thinking about using current metabolomics technology and resources for their bench and clinical research. Role: Co-PI

No Grant Number Zeisel (PI) 07/01/12-06/30/17
Nestlé Foundation
Developing Screening Platforms to Enhance Brain Development and Function
This goal of this project is to develop a screening platform using cell culture and mouse models that will identify bioactives in milk, foods, and plants that have potential to enhance brain development and function.
Role: PI