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**Steven H. Zeisel, MD, PhD**

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**Experience, Professional**

- 2006–present University of North Carolina at Chapel Hill. *Director, Nutrition Research Institute*
- 2005–present University of North Carolina at Chapel Hill. *Kenan Distinguished University Professor of Nutrition and Pediatrics*
- 1999– 2007 University of North Carolina at Chapel Hill. *Associate Dean for Research, School of Public Health*
- 1990-2005 University of North Carolina at Chapel Hill. *Chairman, Department of Nutrition, School of Public Health and School of Medicine*
- 1990-present University of North Carolina at Chapel Hill. *Professor of Nutrition and Pediatrics*
- 2004-2005 University of North Carolina at Chapel Hill. *AICR/WCRF Professor in Food, Nutrition and Prevention of Cancer*
- 1982–1990 Boston University School of Medicine. *Assistant, Associate and Full Professor, Department of Pathology*
- 1982–1990 Boston City Hospital Department of Pediatrics. *Assistant, Associate Visiting Physician*

**Education**

- 1980-1981 *Postdoctoral Fellow in Neurochemistry.* Massachusetts Institute of Technology
- 1978-1981 *Fellow in Human Nutrition.* Children's Hospital Medical Center, Boston.
- 1977-1980 *Doctor of Philosophy. Nutrition.* Massachusetts Institute of Technology.
- 1975-1977 *Pediatric Resident.* Yale-New Haven Hospital.
- 1971-1975 *Doctor of Medicine.* Harvard Medical School
- 1967-1971 *Bachelor of Science.* Massachusetts Institute of Technology

**National and International Service****National Panel Service**

- 2001-2005 Scientific Advisory Panel, Dietary Supplements, Food and Drug Administration USA.
- 1997-1999 National Academy of Sciences, U.S.A., Committee on Dietary Required Intakes, Panel on Folate, B-vitamins and Choline.
- 2004-2011 Scientific panel, second version of "Food, Nutrition and the Prevention of Cancer: a global perspective", World Cancer Research Fund.

**National Institutes of Health Study sections**

- 2014 NIH Special Emphasis Review Panel – Diabetes Research Center
- 2012 NIDDK Diabetes Research Centers (P30)
- 2011 Chair, Molecular Mechanisms for Actions of Botanicals Study Section, NIH.
- 2010 Nutrition Obesity Research Centers study section, NIH
- 2004-2006 Chair, Integrative Nutrition and Metabolic Processes study section, NIH
- 2003 Chair, Special Emphasis Panel, NIH
- 2000-2006 Integrative Nutrition and Metabolic Processes study section, NIH

**Editorial Board Service**

Editorial Board, *Journal of Nutrition*, Vol. 138, 2010

Section Editor, *Frontiers in Nutrigenomics*, 2010-present.  
Editorial Board, *FASEB Journal*, 2005-present.  
Editorial Board, *Functional Food Reviews*, 2009-present.  
Associate Editor, *Functional Food Reviews*, 2008-present.  
Editorial Board, *Annual Review of Nutrition*, 2003-2008.  
Consultant editor, *Nutrition Research*, 1996-present.

#### Professional Society and Industry Service

External Advisory Board for the Nutrition Obesity Research Center at Harvard (NORC-H)  
Member, Academy of Nutrition and Dietetics Research Advisory Board (formerly the American Dietetic Association), 2012  
Member, Hershey Health & Wellness Advisory Board, 2005-2009.  
Member, Board of Trustees of the North American branch of the International Life Sciences Institute (ILSI N.A.), 2004-2007.  
President, American Society for Nutrition 2002-2003; (this is the premier nutrition research society and a component of FASEB Journal). Strategic Oversight Committee, 2004-present; Chair, Long-Range Planning Committee, 2000-2001; Chair, Graduate Nutrition Education Committee, 1997-1999; Chair, Standing Committee on Medical/Dental School Residency Nutrition Education and Subspecialty Training, 1995-1997; Councilor, 1991-1994; Chair, Membership Committee, 1990-1994.  
Member, Board of Scientific and Policy Advisors, American Council on Science and Health, 2000-present.  
Member, NCI/FDA Biomarker and Cancer Risk Workshop, 2006.  
Member, Dupont Health Advisory Board, 2005-present.  
Member, Solae Scientific Advisory Board, 2005-present.  
Member, Western Pistachio Association, 2011-present.  
Member, Metabolon Scientific Advisory Board, 2009-present.  
Member, GenoVive Scientific Advisory Board, 2012-present.  
Member, Advisory Board to the Commission on Secretion and Absorption, International Union of Physiological Sciences, 2003-2005.  
Member, Grant Review Panel, American Institute for Cancer Research; 1998-2000.  
External Advisory Board, South Carolina's Center for Cancer Research Excellence, 2009  
External Advisory Board, University of Alabama at Birmingham, Nutrition Obesity Research Center, 2000-present.  
External Advisory Board, Washington University, Nutrition Obesity Research Center, 2000-present.

#### **Honors**

Bernard G. Greenberg Alumni Endowment Award, The University of North Carolina at Chapel Hill, 2013  
Mildred A. Reeves Distinguished Visiting Professor in Nutrition, University of Tennessee, 2011  
Hans Falk Memorial Lecturer, National Institute of Environmental Health Sciences, 2010  
W.O. Atwater Lecturer, U.S. Department of Agriculture's Agricultural Research Service, 2009  
The American Society for Nutrition Osborne and Mendel Award, 2008.  
The American College of Nutrition Award for Outstanding Achievements in Nutrition, 2007.  
Bristol-Meyers Squibb/Mead Johnson Award for Distinguished Achievement in Nutrition Research, 2006.  
Who's Who in the World, 2004-present.

#### **Membership in Professional Societies**

American Society for Nutrition (formerly American Institute of Nutrition and American Society for Clinical Nutrition), 1987-present.

#### **Grant Support - Current**

NIDDK, P30 DK56350, University of North Carolina Nutrition Obesity Research Center (S. Zeisel, P.I.) 09/30/99-03/31/16, \$725,756 annual direct (\$7,257,560 total award).

- US Department of Agriculture, 58-1235-0-185, Choline Content of Commonly Eaten Foods (S. Zeisel, P.I.) 09/17/05 – 08/31/15, \$1,900 annual direct.
- Pfizer (No Number), Develop a screening platform using cell culture and mouse models (S. Zeisel, P.I.) 02/01/12 – 01/31/17, \$200,000 annual direct (\$1,000,000).
- Pfizer (No Number), Human metabolomics profiling studies on breast milk and microbiome (S. Zeisel, P.I.) 02/01/12 – 01/31/17, \$150,000 annual direct (\$750,000 total award).
- NIH R25 GM103802-01, Online learning platform: introducing clinicians and researchers to metabolomics (S. Zeisel, Co-PI) 09/01/12 – 08/31/2017, \$51,552 annual direct (\$489,999 total award).
- NIH R01DK104371, Transition to a western diet and cardiometabolic risk: Biomarkers derived from the microbiome (S. Zeisel, Co-P.I.) 07/01/2015 – 06/30/2020, \$198,158 annual direct (\$3,490,987 total award).

### Publications (last 5 years from more than 250 publications)

#### Peer Reviewed

1. **Zeisel, S.H.** (2011) What choline metabolism can tell us about the underlying mechanism of fetal alcohol spectrum disorders. *Molecular Neurobiology*. doi 10.1007/s12035-011-8165-5. PMID: 21259123.
2. da Costa, K-A, Sanders, L.M., Fischer, L.M., Zeisel, S.H., (2011) Docosahexaenoic acid in plasma phosphatidylcholine may be a potential marker for in vivo phosphatidylethanolamine N-methyltransferase activity in humans. *American Journal of Clinical Nutrition*. 93(5): 968-74. PMID: PMC3076652.
3. **Zeisel, S.H.** (2011) The supply of choline is important for fetal progenitor cells. *Seminars in Cell and Development Biology*. 22: 624 - 628. PMID: PMC3188336.
4. Teng, Y-W, Mehedint, M.G., Garrow, T.A., **Zeisel, S.H.** (2011) Deletion of betaine-homocysteine S-methyltransferase in mice perturbs choline and 1-carbon metabolism, resulting in fatty liver and hepatocellular carcinoma. *Journal of Biological Chemistry*. 286(42): 36258 – 67. PMID: PMC3196139.
5. **Zeisel, S.H.** (2011) Dietary choline deficiency causes DNA strand breaks and alters epigenetic marks on DNA and histones. *Mutation Research*. 733: 34 – 38. PMID: PMC3319504.
6. **Zeisel, S.H.** (2011) Choline Metabolism Provides Novel Insights into Non-alcoholic Fatty Liver Disease and its Progression. *Current Opinion in Gastroenterology*. 28(2): 159 – 165. PMID: 22134222.
7. Teng, Y-W, Ellis, J.M., Coleman, R.A., **Zeisel, S.H.** (2012) Mouse Betaine-Homocysteine S-Methyltransferase deficiency reduces body fat via increasing energy expenditure and impairing lipid synthesis and enhancing glucose oxidation in white adipose tissue. *Journal of Biological Chemistry*. 287(20): 16187 – 98. PMID: 22362777.
8. Johnson, A.R., Lao, S., Wang, T., Galanko, J.A., **Zeisel, S.H.**, (2012) Choline dehydrogenase polymorphism rs12676 is a functional variation and is associated with changes in human sperm cell function. *PLoS ONE*. 7(4): e36047. PMID: 22558321.
9. Richman, E.L., Kenfield, S.A., Stampfer, M.J., Giovannucci, E.L., **Zeisel, S.H.**, Willett, W.C., Chan, J.M. (2012) Choline intake and risk of lethal prostate cancer: incidence and survival. *American Journal of Clinical Nutrition*. 96(4): 855 – 863. PMID: 22952174.
10. Cheatham, C.L., Goldman, B.D., Fischer, L.M., da Costa, K-A, Reznick, S., **Zeisel, S.H.** (2012) Phosphatidylcholine supplementation in pregnant women consuming moderate choline diets does not enhance infant cognitive function: a randomized double-blind placebo-controlled trial. *American Journal of Clinical Nutrition*. 96(6): 1465 – 72. PMID: PMC3497930.
11. Tsang, V., Fry, R., Niculescu, M., Saunders, J., Paul, D., **Zeisel, S.H.**, Waalkes, M., Styblo, M., Drobna, Z. (2012) The epigenetic effects of a high prenatal folate intake in male mouse fetuses exposed in utero to arsenic. *Toxicology and Applied Pharmacology*. 264(3): 439 – 50. PMID: PMC3478409.
12. **Zeisel, S.H.**, Waterland, R.A., Ordovas, J.M., Muoio, D., Jia, W., Fodor, A. (2012) Highlights of the 2012 Research Workshop: Using Nutrigenomics and Metabolomics in Clinical Nutrition Research. *Journal of Parenteral and Enteral Nutrition*. doi: 10.1177/0148607112462401. PMID: PMC3593226.

13. **Zeisel, S.H.** (2012) Metabolic crosstalk between choline/1-carbon metabolism and energy homeostasis. *Clinical Chemistry and Laboratory Medicine*. 51(3): 467 - 75. PMID: PMC3624053.
14. Teng, Y-W, Cerdena, I., **Zeisel, S.H.** (2012) Homocysteinemia in Mice with Genetic Betaine Homocysteine S-Methyltransferase Deficiency Is Independent of Dietary Folate Intake. *The Journal of Nutrition*. 142(11): 1964 – 7. PMID: PMC3497933.
15. Corbin, K.D., Abdelmalek, M.F., Spencer, M.D., da Costa, K-A, Galanko, J.A., Sha, W., Suzuki, A., Guy, C., Cardona, D.M., Torquati, A., Diehl, A.M., **Zeisel, S.H.** (2013) Genetic signatures in choline and 1-carbon metabolism are associated with the severity of hepatic steatosis. *FASEB Journal*. 1674 – 1689. PMID: PMC3606533.
16. Dominguez-Salas, Paula, Moore, S.E., Cole, D., Cox, S.E., da Costa, K-A, Dyer, R.A., Fulford, T., Innis, S.M., Waterland, R.A., **Zeisel, S.H.**, Prentice, A.M., Henning, B.J. (2012) DNA methylation potential: dietary intake and blood concentrations of one-carbon metabolites and cofactors in rural African women. *American Journal of Clinical Nutrition*, 1217 - 1227. PMID: PMC3652920.
17. Xie, G., Zhong, W., Li, H., Li, Q., Qiu, Y., Zhen, X., Chen, H., Zhao, X., Zhang, S., Zhou, Z., Zeisel, S.H., Jia, W. (2013) Alteration of bile acid metabolism in the rat induced by chronic ethanol consumption. *FASEB Journal*. 3583 – 93. PMID: PMC3752538.
18. Fuglestad, A.J., Fink, B.A., Eckerle, J.K., Boys, C.J., Hoecker, H.L., Kroupina, M.G., Zeisel, S.H., Georgieff, M.K., & Wozniak, J.R. (2013) Inadequate intake of nutrients essential for neurodevelopment in children with fetal alcohol spectrum disorders (FASD). *Neurotoxicology and Teratology*. 128 – 32. PMID: PMC3795902.
19. Wozniak, J. R., Fuglestad, A. J., Eckerle, J. K., Kroupina, M. G., Miller, N. C., Boys, C. J., Brearley, A. M., Fink, B. A., Hoecker, H. L., Zeisel, S.H., & Georgieff, M. K. (2013) Choline supplementation in children with Fetal Alcohol Spectrum Disorders (FASD) has high feasibility and tolerability. *Nutrition Research*. 897 – 904. PMID: PMC3815698.
20. 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(7): 2970-8. Fj.14-249557. PMID: PMC4015319.
21. Xiaojiao, Z., Qiu, Y., Zhong, W., Baxter, S., Su, M., Li, Q., Xie, G., Ore, B., Qiao, S., Spencer, M., Zeisel, S.H., Zhou, Z., Zhao, A., Jia, W. (2013) A targeted metabolomics protocol for short-chain fatty acids and branched-chain amino acids. *Metabolomics*. 9: 818 – 827. PMID: PMC3756605.
22. Dominguez-Salas, P., Moore, S.E., Baker, M.S., Bergen, A.W., Cox, S.E., Dyer, R.A., Fulford, A.J., guan, y., Laritsky, E., Silver, M., Swan, G.E., Zeisel, S.H., Innis, S.M., Waterland, R.A., Prentice, A.M., Hennig, B.J. (2014) Maternal nutrition at conception modulates DNA methylation of human metastable epialleles. *Nature Communications* <http://dx.doi.org/10.1038/ncomms4746>. PMID: PMC4015319.
23. Miller, C.A., Corbin, K.D., da Costa, K-A, Zhang, S., Zhao, X., Galanko, J.A., Blevins, T., Bennett, B.J., O'Connor, A., Zeisel, S.H. (2014) Effect of egg ingestion on TMAO production in humans: a randomized controlled, dose-response study. *American Journal of Clinical Nutrition*. 100: 778-86. PMID: PMC4135488.
24. Martinez-Vega, R., Carrido, F., Cediell, R., Partearroyo, T., Vallecillo, N., Zeisel, S.H., Varela-Moreiras, G., Martinez-Alvarez, C., Varela-Nieto, I., Parajes, M. (2014) Folic acid deficiency induces premature hearing loss through mechanisms involving cochlear oxidative stress and impairment of homocysteine metabolism. *FASEB Journal*. 29(2) 418 – 32. PMID: PMC4314232.
25. Schenkel, L.C., Singh, R.K., Michel, V., Zeisel, S.H., da Costa, K-A, Johnson, A.R., Mudd, H.S., Bakovic, M. (2014) Mechanism of choline deficiency and membrane alteration in postural orthostatic tachycardia syndrome primary skin fibroblasts. *FASEB Journal*. 29(5):1663-75. PMID: PMC4415014.
26. 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(5):1012-1023. PMID: PMC4409521.

27. Silver, M., Corbin, K., Hellenthal, G., da Costa, K., Dominguez-Salas, P., Moore, S., Owen, J., Prentice, A., Hennig, B., Zeisel, S.H. (2015) Evidence for negative selection of gene variants that increase dietary choline requirement in a Gambian cohort. *FASEB Journal*. 29(8): 3426 - 35. PMID: PMC4511208.
28. Orena, S., Owen, J., Jin, F., Fabian, M., Gillitt, N., **Zeisel, S.H.** (2015) Extracts of fruits and vegetables activate the anti-oxidant response element (ARE) in IMR-32 cells. *Journal of Nutrition*. 145(9): 2006- 11.
29. Zhao, X., **Zeisel, S.H.**, Zhang, S. (2015) A rapid LC-MRM/MS assay for simultaneous quantification of choline, betaine, trimethylamine, trimethylamine N-oxide and creatinine in human plasma and urine. *Electrophoresis*. 36: 2207–2214.
30. Strauss, K.A., Ferreira, C., Bottiglieri, T., Zhao, X., Arning, E., Zhang, S., **Zeisel, S.H.**, Escolar, M.L., Presnick, N. Puffenberger, E.G., Vugrek, O., Kovacevic, L., Wagner, C., Mazariegos, G.V., Mudd, S.H., Soltys, K., (2015) Liver transplantation for treatment of severe S-adenosylhomocysteine hydrolase deficiency. *Molecular Genetics and Metabolism*. 116(1-2): 44 – 52.
31. Zwart, S.R., Gregory, J.F., **Zeisel, S.H.**, Gibson, C.R., Mader, T.H., Kinchen, T.H., Ueland, P.M., Ploutz-Snyder, R., Heer, M., Smith, S.M. (2015) Genotype, B-vitamin status, and adrogens affect space flight-induced ophthalmic changes *FASEB Journal*. 30(1): 141 – 148. PMID: PMC4684521.
32. 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(5): 1113 – 25. PMID: PMC4625582.
33. Wang, Y., Surzenko, N., Friday, W., **Zeisel, S.H.** (2016) Maternal Dietary Intake of Choline in Mice Regulates Development of the Cerebral Cortex in the Offspring. *FASEB Journal*. 30(4): 1566 – 78. PMID: PMC4799499.
34. Nilsson, T., Hurtig-Wennlof, A., Sjostrom, M., Herrmann, W., Obeid, R., **Zeisel, S.H.** (2015) Plasma 1-carbon metabolites and academic achievement in 15-year-old adolescents. *FASEB Journal*. 30: 1683 – 88. PMID: PMC4799502.
35. Meyer, K.A., Benton, T.Z., Bennett, B.J., Jacobs, D.R., Lloyd-Jones, D.M., Gross, M.D., Carr, J., Gordon-Larsen, P., **Zeisel, S.H.** (2016) The microbiota-dependent metabolite trimethylamine N-oxide (TMAO) and coronary artery calcium in the Coronary Artery Risk Development in Young Adults Study (CARDIA). *Journal of the American Heart Association*. [IN PRESS].

#### **Non-Peer Reviewed Publications (from last 5 years)**

1. **Zeisel, S.H.** (2011) Dietary choline, betaine, methionine, and epigenetic mechanisms influencing brain development. In *Nutrition in Epigenetics*, edited by M. Niculescu, Wiley-Blackwell, UK. 225-240.
2. Caudill, M.A., da Costa, K-A, Zeisel, S.H. (2012) Elevating awareness and intake of an essential nutrient for public health. *Nutrition Today*. 46(5): 235 - 241.
3. Zeisel, S.H., (2012) Diet-Gene interactions underlie metabolic individuality and influence brain development: implications for clinical practice derived from studies on choline metabolism. *Annuals of Nutrition and Metabolism*. 60: 19-25. PMID: 22614815.
4. Johnson, A., Zeisel, S.H. (2012) Dietary Choline for brain development. In *International Handbook of Behavior, Diet and Nutrition*, edited by Victor R. Preedy, Springer, New York, NY 2089 – 2104.
5. **Zeisel, S.H.** (2011) Choline and Phosphatidylcholine. (2012) In *Modern Nutrition in Health and Disease, 11<sup>th</sup> Edition*. edited by C. Ross, B. Caballero, R. Cousins, K. Tucker, T. Ziegler, Lippincott Williams & Wilkins, Moncton, VT 416 – 426.
6. **Zeisel, S.H.**, Corbin, K. (2012) Choline and Brain Development. In *10<sup>th</sup> Edition of Present Knowledge of Nutrition*, jointly edited by J.W. Erdman, I.A. MacDonald and S.H. Zeisel, Wiley-Blackwell, Hoboken, NJ. 405 – 418.



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