Barbara Strupp

Web Bio

Information

Biography

Biographical Statement

Barbara Strupp received her Bachelor's degree in Ethology from Washington University in 1976, and her Ph.D. degree in Psychology in 1982 from Cornell University. She conducted postdoctoral research at the National Institutes of Health (Biological Psychiatry Branch, NIMH) from 1981-1983. She then returned to Cornell University in 1983, funded by a National Institutes of Health New Investigator Research Award. She currently serves as Professor in the Division of Nutritional Sciences, and Adjunct Professor in the Department of Psychology. Professor Strupp is a member of the Graduate Fields of Nutrition, Psychology, and Environmental Toxicology and the Program in Neuroscience. Her research group has been funded by three institutes at the NIH (NICHD, NIDA, and NIMH). These grants have supported research on numerous causes of human cognitive dysfunction (malnutrition, PKU, early lead exposure, prenatal cocaine exposure, Down syndrome, and Fragile X syndrome), as well as the development of novel techniques for detecting and delineating cognitive and affective dysfunction in rodent models.

Strupp's research primarily deals with causes of human cognitive dysfunction, studies that involve both children and rodent models. The goals of the animal studies are to determine the nature and underlying neural basis of the cognitive dysfunction, with implications for therapeutic intervention and for elucidating basic brain-cognition relationships. Current projects (described below) focus on (1) the lasting effects of maternal choline supplementation in rodent models (including a murine model of Down syndrome) and humans, and (2) the lasting effects of developmental exposure to manganese.

Department Website Summary

More choline for pregnant, nursing women could reduce Down syndrome dysfunction, guard against dementia
The right nutrient can boost baby's brain function

Teaching

Professional

Current Professional Activities

Cornell University Graduate Field Membership: Psychology; Nutrition; Environmental Toxicology

Editorial Board, Neurotoxicology and Teratology

External Advisory Committee, NIH Program Project grant concerning the Cognitive and Neural Effects of Early Developmental Iron Deficiency; Center for Human Growth and Development, University of Michigan, B. Lozoff, PI, 2003-present.

Neurobehavioral Teratology Society, Constitution and Bylaws Committee, Member, 2012-2014, Chair 2013-2014

Research

Current Research Activities

1. Maternal choline supplementation research: We have found that supplementing the maternal diet during pregnancy and lactation significantly improves attention, spatial cognition, and emotion regulation in a mouse model of Down syndrome. A more circumscribed improvement in attention was also seen in the Wildtype littermates. I am currently involved in a collaborative study with investigators at Rush University Medical Center and NYU to elucidate the underlying neural mechanisms. We have found that MCS improves spatial cognition in the Ts65Dn mice which is mediated, at least in part, by protection of medial septal cholinergic neurons, which atrophy in these mice with the onset of Alzheimer-like neuropathology. We have also found that MCS increases adult hippocampal neurogenesis in the Ts65Dn mice, and that this correlates with the improved spatial cognition of these mice. Furthermore we have found evidence for improved neurotrophin function in these trisomic mice, which may contribute to the protection of BFCN neurons in these mice, and subsequently their improved cognitive functioning. The results of these studies will have implications for minimizing cognitive and affective function in individuals who have Down syndrome as well as provide new information concerning the mechanism by which perinatal choline supplementation exerts lifelong benefits on cognitive functioning in normal rodents. These findings will have important clinical implications for identifying the choline intake during pregnancy and lactation that is optimal for cognitive functioning throughout the lifespan. These collaborative studies linking behavioral and neural changes are in progress.

2. In addition, in collaboration with DNS colleagues, (Drs. Caudill, Canfield and Finkelstein), I am also planning a parallel study involving choline supplementation of pregnant women, followed by assessment of cognitive and affective benefits in the infants, and epigenetic analyses of placental tissue.

3. I am collaborating on a project with collaborators at UC Santa Cruz and the University of Illinois to investigate the lasting cognitive and neural effects of early developmental exposure to Manganese. We have found evidence for attentional and fine motor dysfunction in the rats exposed early in life, and have found evidence for catecholaminergic alterations in these same animals. Importantly treatment with methylphenidate (Ritalin) completely normalized the fine motor

dysfunction in the manganese exposed animals. We are planning future studies to further explore the mechanisms underlying these areas of dysfunction and test potential therapies.

4. Dr Paul Soloway and I are planning to investigate whether the lasting cognitive benefits of maternal choline supplementation in the Ts65Dn mouse model of Down syndrome and normal littermates are mediated by epigenetics effects due to choline's role as a methyl donor. These studies will also help ascertain possible adverse effects of MCS on other systems (e.g., cancer).

Extension

Education

Education

Washington University, B.A. (Ethology), 1976

Cornell University, Ph.D. (Biopsychology), 1982

National Institutes of Health (National Institute of Mental Health) Postdoctoral Fellow, 1981-1983

Courses

Courses Taught

NS 7030 Graduate Seminar in Nutrition

NS 4010 Empirical Research in Nutrition

NS 4990 Honors Research in Nutrition

Psych 4700 Undergraduate Research in Psychology

Bio 2990 Undergraduate Research in Biology

Bio 4990 Undergraduate Research in Biology

Websites

Related Websites

Psychology Web Page

Program in Neuroscience

Graduate Field of Environmental Toxicology

Administration

Administrative Responsibilities

Member, Curriculum Committee, Division of Nutritional Sciences, 2011-2014 (Acting Chairperson, Spring 2013)

Appointments and Tenure Committee, Division of Nutritional Sciences, Cornell University, 2014-17; Co-Chair, 2014-2015;

Life Sciences Advisory Council (LSAC), member, 2014-2017

Letter-writer for HCEC (Health Careers Evaluation Committee), 2013, 2014

Member, Ad Hoc Committee advising Dean Boor on the tenure of Dr. Lori Leonard, Cornell University, January-February 2014

Publications

Selected Publications

Strupp BJ & Beaudin S. Assessing the neurobehavioral effects of early toxicant exposure: A perspective from animal research. In: Bellinger D (ed.), Human Developmental Neurotoxicology, New York, NY: Taylor & Francis Group, 2006: 415-445.

Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B; International Child Development Steering Group. Developmental potential in the first 5 years for children in developing countries. *Lancet.* 2007 Jan; 369(9555):60-70.

Stangle DE, Smith D, Beaudin SA, Strawderman MS, Levitsky DA, and Strupp BJ. Succimer chelation improves cognition and arousal regulation in lead-exposed rats but produces lasting cognitive impairment in the absence of lead exposure. Environ Health Perspect. 2007 Feb;115(2):201-9. Epub 2006 Oct 30.

McNaughton, C. H., Moon, J., Strawderman, M. S., Maclean K. N., Evans, J., Strupp, B. J. (2008). Evidence for social anxiety and impaired social cognition in a mouse model of Fragile X syndrome. Behav. *Neurosci,* 2008 Apr;122(2):293-300.

Moon J, Ota KT, Driscoll LL, Levitsky DA, Strupp BJ (2008). A mouse model of Fragile X syndrome exhibits heightened arousal and/or emotion following errors or reversal of contingencies. *Developmental Psychobiology,* 2008 Jul;50(5):473-85.

Moon J., Chen M, Gandhy SU, Strawderman M, Levitsky DA, Maclean KN, and Strupp BJ. Perinatal choline supplementation improves cognitive functioning and emotion regulation in the Ts65Dn mouse model of Down syndrome. Behavioral Neuroscience, 2010, 124 (3):346–361.

Field MS, Shields KS, Abarinov EV, Malysheva OV, Allen RH, Stabler SP, Ash JA, Strupp BJ, Stover PJ, and Caudill MA. Reduced MTHFD1 activity in mice perturbs folate and choline dependent one-carbon metabolism as well as transsulfuration. J. Nutrition, 2013 Jan;143(1):41-5. doi: 10.3945/jn.112.169821. Epub 2012 Nov 28.

Ash JA, Jiang X, Malysheva OV, Fiorenza CG, Bisogni AJ, Levitsky DA, Strawderman MS, Caudill MA, Stover PJ, Strupp BJ. Dietary and genetic manipulations of folate metabolism differentially affect neocortical functions in mice. Neurotoxicol

Teratol. 2013 Jul-Aug; 38:79-91. doi: 10.1016/j.ntt.2013.05.002. Epub 2013 May 15.

Velazquez, R., Kelley, C.M., Powers, B.E., Ash, J.A., Ginsberg, S.D., Mufson, E.J., and Strupp, B.J: B.J: Maternal choline supplementation improves spatial learning and adult hippocampal neurogenesis in the Ts65Dn mouse model of Down syndrome, Neurobiol. Dis. 58 (2013) 92–101.

CM. Kelley, BE Powers, R Velazquez, J A Ash, SD Ginsberg, BJ Strupp, EJ Mufson (2013). Sex differences in cholinergic basal forebrain in the Ts65Dn mouse model of Down syndrome and Alzheimer's disease, Brain Pathology doi:10.1111/bpa.12073.

CM. Kelley, BE Powers, R Velazquez, J A Ash, SD Ginsberg, BJ Strupp, EJ Mufson (2013). Perinatal choline supplementation differentially alters the basal forebrain cholinergic system of young-adult Ts65Dn and disomic mice. J Comp Neurol. 2013 Nov 1. doi: 10.1002/cne.23492. [Epub ahead of print].

Smith D, Strupp BJ. The Scientific Basis for Chelation: Animal Studies and Lead Chelation (2013). J Med Toxicol. 2013 Dec; 9(4):326-38. doi: 10.1007/s13181-013-0339-2.

Kelley CM, Powers BE, Velazquez R, Ash JA, Ginsberg SD, **Strupp BJ**, Mufson EJ (2014). Perinatal choline supplementation differentially alters the basal forebrain cholinergic system of young-adult Ts65Dn and disomic mice. *J Comp Neurol.* 2014 Apr 15;522(6):1390-410. PMCID: 3959592

Yan, J., Ginsberg, S.D., Powers, B., Alldred, M.J., Saltzman, A., **Strupp, B.J.,** and Caudill, M.A.: Maternal choline supplementation programs greater activity of the phosphatidylethanolamine N-methyltransferase (PEMT) pathway in adult Ts65Dn trisomic mice. *FASEB J.*, 28: 4312-423, 2014. PMID: 24963152.

Ash A, Velazquez R, Kelley CM, Powers BE, Strawderman M, Ginsberg SD, Mufson EJ**, Strupp BJ**. Maternal choline supplementation improves spatial mapping and increases number and size of basal forebrain cholinergic neurons in aged Ts65Dn mice; *Neurobiology of Disease*, 2014 Oct;70:32-42. doi: 10.1016/j.nbd.2014.06.001. Epub 2014 Jun 14.

Driscoll LL & Strupp BJ. Assessment of attention and inhibitory control in rodent developmental neurotoxicity studies. *Neurotoxicology and Teratology*, **in press**; doi: 0.1016/j.ntt.2014.09.001 (to be published March 2015)

Beaudin SA, Strupp BJ, Lasley SM, Fornal CA, Mandal S, Smith DR. Oral methylphenidate alleviates the fine motor dysfunction caused by chronic postnatal manganese exposure. *Toxicological Sciences*, **in press**