

CURRICULUM VITAE

WILLIAM THOMAS JOHNSON

ADDRESS:

USDA-ARS
Grand Forks Human Nutrition Research Center
2420 2nd Avenue North, Stop 9034
Grand Forks, North Dakota 58202-9034
Phone (701)795-8411

EDUCATION:

Montana State University, Bozeman
B.S. in Physics 1968

University of North Dakota, Grand Forks
Ph.D. in Biochemistry 1976

MEMBERSHIPS:

American Society for Nutritional Sciences
American Society for Biochemistry and Molecular Biology
Sigma Xi
American Association for the Advancement of Science

HONORS and AWARDS:

Elected to Phi Kappa Phi 1968
Elected to Pi Mu Epsilon (Mathematics Honor Society) 1968
Graduated with Distinction 1968
Sigma Xi Award for Outstanding Graduate Research 1976
Certificate of Appreciation 1999-in recognition for leadership in restoration of the flood-damaged animal care facilities at the Grand Forks Human Nutrition Research Center.

EXPERIENCE:

- 2010- USDA GRAND FORKS HUMAN NUTRITION RESEARCH CENTER
Collaborator(Unfunded): Assist in collecting, analyzing and interpreting data to assess glycolysis and mitochondrial energy production in cells derived from adipose tissue, muscle and leukocytes.
- 1987-2010 USDA GRAND FORKS HUMAN NUTRITION RESEARCH CENTER
Research Chemist: Responsible for conceiving, planning and conducting research into the biological roles of trace element and mineral nutrients with particular emphasis on cell membrane structure and function, cell signaling mechanisms, and mitochondrial function. Serves as Lead Scientist with responsibilities for fiscal and physical resource management and supervision of support personnel. Serves as an Adjunct Assistant Professor and Graduate Faculty in the Department of Biochemistry at the University of North Dakota School of Medicine.
- 1985-1987 UNIVERSITY OF NORTH DAKOTA, DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY
Research Assistant Professor: Conducted research directed toward understanding the roles of copper and iron in macrophage function and immunoregulation. Lectured to graduate students in topics of advanced enzymology.

1978-1985 UNIVERSITY OF NORTH DAKOTA, DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

Postdoctoral Fellow: Conducted research into the biochemical mechanisms involved in the absorption and transport of copper and zinc. Studied the relationships between nutrients and trace element metabolism in diabetic rats. Helped develop methods for applying enzyme assays in the assessment of copper and zinc status in animals and humans.

1977-1978 OREGON STATE UNIVERSITY, DEPARTMENT OF AGRICULTURAL CHEMISTRY AND ENVIRONMENTAL HEALTH SCIENCES

Postdoctoral Research Associate: Investigated the interactions of hydroxychlorobiphenyls with cytochrome b₅. Studied the effects of hydroxychlorobiphenyls on the lipid-protein interactions in reconstituted cytochrome b₅-dimyristyl phosphatidylcholine proteoliposomes and erythrocyte membranes.

1971-1976 UNIVERSITY OF NORTH DAKOTA, DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY

Graduate Research Assistant: Conducted detailed enzyme kinetic studies on the effects of metal ions and polyamines on the hydrolytic and synthetic activities of the enzyme, glucose-6-phosphatase.

INVITED PRESENTATIONS:

"Effects of Copper Deficiency on Glucose-6-P Phosphohydrolase and Phosphotransferase Activities." Annual Frank N. Low Research Day, University of North Dakota School of Medicine, Grand Forks (1984).

"Trace Element Metabolism and Diabetes." Department of Foods and Nutrition, North Dakota State University, Fargo (1986).

"Copper Deficiency, Some Newer Perspectives." Department of Biochemistry and Molecular Biology, University of North Dakota, Grand Forks (1988).

"Copper Deficiency and Cell Function." Department of Foods and Nutrition, North Dakota State University, Fargo (1989).

"Copper Deficiency and Transmembrane Signaling." Sigma Xi Chapter, University of Manitoba, Winnipeg (1989).

"Copper and Stimulus Response Coupling in Platelets." Federation of American Societies for Experimental Biology Summer Conference, "Micronutrients: Trace Elements," Copper Mountain, Colorado (1992).

"Oxidative Damage and Mitochondrial Diseases." Interactive Video Network, University of North Dakota (1999).

"The Biological Role of Copper in Signal Transduction: From Platelets to Cancer." Department of Anatomy and Cell Biology, University of North Dakota School of Medicine and Health Sciences (2001).

"Maternal Copper Deficiency has Negative Cardiac Effects in the First Generation." Department of Anatomy and Cell Biology, University of North Dakota School of Medicine and Health Sciences (2007).

OTHER ACTIVITIES:

Ad hoc reviewer for Biological Trace Element Research, Proceedings of the Society for Experimental Biology, Journal of Nutrition, American Journal of Clinical Nutrition, The Journal of Nutritional Biochemistry, Metabolism, Thrombosis and Haemostasis, Nutrition, Biofactors, Biochimica et Biophysica Acta, Mechanisms of Aging and Development, Cardiovascular Toxicology, Nutritional Neuroscience, Life Science, Cell Biology International, Journal of Trace Elements in Experimental Medicine, Journal of Agriculture and Food Chemistry, British Journal of Nutrition, Experimental Biology and Medicine, Journal of Animal Science.

Ad hoc reviewer for USDA National Competitive Grants Program, Jewish Hospital Foundation (Louisville, Kentucky).

Chair, GFHNRC Animal Care and Use Committee, 1994-Present

President Elect/President, University of North Dakota Chapter of Sigma Xi, 1994-1996

Mentor for Howard Hughes Undergraduate Apprentice, 1995-1997

Chair, Copper I Minisymposium, Experimental Biology, 1997

Chair, GFHNRC Vivarium Restoration Task Force, May 1997-June 1999.

Panel member, Improving Human Nutrition for Optimal Health Program, a section of the USDA National Research Initiative Competitive Grants Program, Washington, DC, 1999.

Invited reviewer for abstracts submitted in the category of cardiovascular and pulmonary diseases for presentation at the International Society for Trace Element Research in Humans meeting, Hersonissos, Crete-Greece, 2007.

GRADUATE SCHOOL COMMITTEES :

Served or currently serving (* as scientific advisor) on Graduate Advisory Committees for the following students:

Daniel C. Henjum M.S. in Nutrition and Food Science, August 1989
North Dakota State University

Joan Berntson M.S. in Biochemistry, May 1992
University of North Dakota

Tom LaBerge M.S. in Biochemistry, May 1995
University of North Dakota

Anne C. Thomas* M.S. in Biochemistry, December 1996
University of North Dakota

Laura Sumner* Ph.D. in Biochemistry, 2002
University of North Dakota

Peter Leary M.S. in Biochemistry, 2007
University of North Dakota

PUBLICATIONS:

Colilla, W., Johnson, W.T. and Nordlie, R.C. The nature of modifications by various anions of synthetic and hydrolytic activities of multifunctional glucose-6-phosphatase. *Biochim. Biophys. Acta* 364:78-87, 1974.

Johnson, W.T., Colilla, W. and Nordlie, R.C. Differential effects of Mg^{2+} on various hydrolytic and synthetic activities of multifunctional glucose-6-phosphatase. *Arch. Biochem. Biophys.* 163:297-305, 1974.

Johnson, W.T. The differential effects of Cu^{2+} on multifunctional glucose-6-phosphatase. Doctoral Dissertation, University of North Dakota, Grand Forks, North Dakota, 1976.

Johnson, W.T. and Nordlie, R.C. The differential effects of Cu^{2+} on carbamyl-P:glucose phosphotransferase and glucose-6-phosphate phosphohydrolase activities of multifunctional glucose-6-phosphatase. *Biochemistry* 16:2458-2466, 1977.

Nordlie, R.C., Johnson, W.T., Cornatzer, W.E., Jr. and Twedell, G.W. Stimulation by polyamines of carbamyl-phosphate:glucose phosphotransferase and glucose-6-phosphate phosphohydrolase activities of multifunctional glucose-6-phosphatase. *Biochim. Biophys. Acta* 585:12-23, 1979.

Johnson, W.T. and Nordlie, R.C. Stimulation of glucose-6-phosphatase is a membrane-mediated event. *Life Sciences* 26:297-302, 1979.

Johnson, W.T. and Evans, G.W. Age dependent variation of copper on tissue and proteins of neonatal rat small intestine. *Proc. Soc. Exp. Biol. Med.* 165:496-501, 1980. Johnson W.T. and Evans, G.W. Isolation of a (copper-zinc)-thionein from the small intestine of neonatal rats. *Biochem. Biophys. Res. Commun.* 96:10-17, 1980.

Evans, G.W. and Johnson, W.T. "Copper Homeostasis" In Inflammatory Diseases and Copper, Ed., J.R.J. Sorensen, The Humana Press, Clifton, New Jersey, pp.3-15, 1982.

Johnson, W.T. and Evans, G.W. Tissue uptake of zinc in rats following the administration of zinc dipicolinate or zinc histidinate. *J. Nutr.* 112:914-919, 1982.

Johnson, W.T. and Evans, G.W. Effects of the interrelationship between dietary protein and minerals on tissue content of trace metals in streptozotocin-diabetic rats. *J. Nutr.* 114:180-190, 1984.

Johnson, W.T., Nordlie, R.C. and Klevay, L.M. Glucose-6-phosphatase activity in copper-deficient rats. *Biol. Trace Element Res.* 6:369-378, 1984.

Johnson, W.T. and Canfield, W.K. Intestinal absorption and excretion of zinc in streptozotocin-diabetic rats as affected by dietary zinc and protein. *J. Nutr.* 115:1217-1227, 1985.

Johnson, W.T. and Canfield, W.K. The effects of endogenous picolinic acid on zinc metabolism in the rat. *Nutr. Res.* 6:1189-1200, 1986.

Canfield, W.K. and Johnson, W.T. The influence of the dietary ratio of polyunsaturated to saturated fatty acids on zinc metabolism. *Nutr. Res.* 7:109-119, 1987.

Davis, M.A., Johnson W.T., Briske-Anderson, M. and Kramer, T.R. Lymphoid cell functions during copper deficiency. *Nutr. Res.* 7: 211-222, 1987.

Mayland, H.T., Kramer, T.R. and Johnson, W.T. Trace elements in the nutrition and immunological response of grazing livestock. *Proceedings, Grazing Livestock Nutrition Conference*, pp. 101-113, 1987.

Johnson, W.T. and Kramer, T.R. Effect of copper deficiency on erythrocyte membrane proteins in rats. *J. Nutr.* 117:1085-1090, 1987.

Kramer, T.R., Johnson, W.T. and Briske-Anderson, M. Influence of iron and the sex of rats on hematological, biochemical and immunological changes during copper deficiency. *J. Nutr.* 118:214-221, 1988.

Dufault, S.N., Sakkinen, P.A. and Johnson, W.T. Copper deficiency alters the response and cytoskeletal organization of thrombin-activated platelets. *Proc. North Dakota Acad. Sci.* 43:44, 1989. (Communication)

Saari, J.T. and Johnson, W.T. Inhibition of cardiovascular effects of copper deficiency with antioxidants. *Proc. North Dakota Acad. Sci.* 43:80, 1989. (Communication)

- Johnson, W.T. and Dufault, S.N. Altered cytoskeletal organization and secretory response of thrombin activated platelets from copper-deficient rats. *J.Nutr.* 119:1404-1410, 1989.
- Johnson, W.T. and Saari, J.T. Dietary supplementation with t-butylhydroquinone reduces cardiac hypertrophy and anemia associated with copper deficiency. *Nutr. Res.* 9:1355-1362, 1989.
- Kramer, T.R., Johnson, W.T. and Briske-Anderson, M. Erythrocytes and latex particles enhance blastogenesis of concanavalin-A stimulated spleen lymphoid cells from copper-deficient rats. *Nutr. Res.* 10:303-314, 1990.
- Greeley, S., Johnson, W.T., Schafer, D. and Johnson, P.E. Gestational alcoholism and fetal zinc accretion in Long-Evans rats. *J. Am. Coll. Nutr.* 9:265-271, 1990.
- Kramer, T.R., Johnson, W.T. and Briske-Anderson, M. Erythrocytes and latex particles correct the impaired mitogenic reactivity of spleen lymphoid cells from copper-deficient rats. *Ann. New York Acad. Sci.* 587:297-299, 1990.
- Johnson, W.T. and Dufault, S.N. Copper deficiency alters protein kinase C mediation of thrombin-induced dense granule secretion from rat platelets. *J. Nutr. Biochem.* 2:663-670, 1991.
- Johnson, W.T. and Saari, J.T. Temporal changes in heart size, hematocrit and erythrocyte membrane protein in copper-deficient rats. *Nutr. Res.* 11:1403-1414, 1991.
- Johnson, W.T. and Dufault, S.N. Intracellular calcium mobilization in rat platelets is adversely affected by copper deficiency. *Biochim. Biophys. Acta* 1175:263-268, 1993.
- Kramer, T.R. and Johnson, W.T. "Copper and Immunity" In Nutrient Modulation of the Immune Response, Ed., S. Cunningham-Rundles, Marcel Dekker, Inc., New York, pp.239-254, 1993.
- Johnson, W.T. The influence of dietary copper on dense granule secretion and cytoskeletal remodeling in thrombin-stimulated rat platelets. *Nutr. Res.* 13:309-318, 1993.
- Dufault, S.N. and Johnson, W.T. Platelet nucleotide concentrations as measured by reverse-phase ion-paired liquid chromatography are affected by copper deficiency. *Proc. North Dakota Acad. Sci.* 47:60, 1993 (Communication).
- Johnson, W.T., Dufault, S.N. and Thomas, A.C. Platelet cytochrome c oxidase is an indicator of copper status in rats. *Nutr. Res.* 13:1153-1162, 1993.
- Saari, J.T., Johnson, W.T., Reeves, P.G. and Johnson, L.K. Amelioration of effects of severe dietary copper deficiency by food restriction in rats. *Am. J. Clin. Nutr.* 58:891-896, 1993.
- Nordlie, R.C., Sukalski, K.A. and Johnson, W.T. Human microsomal glucose-6-phosphatase system. *Eur. J. Pediatr.* 152:S2-S6, 1993.
- Newman, S.M. and Johnson, W.T. Mitochondrial energy states and ultrastructural changes associated with copper deficiency in platelets. *Proc. North Dakota Acad. Sci.* 48:88, 1994 (Communication).
- Smith, T. and Johnson, W.T. Copper deficiency alters the microsomal mixed function oxidase system in rat intestine. *Proc. North Dakota Acad. Sci.* 48:112, 1994 (Communication).
- Johnson, W.T. and Smith, T. Copper deficiency increases cytochrome P450-dependent 7-ethoxyresorufin-O-deethylase activity in rat small intestine. *Proc. Soc. Exp. Biol. Med.* 207:302-308, 1994.

- Sergeant, S. and Johnson, W.T. Iron and copper requirements for proliferation and differentiation of a human promyelocytic leukemia cell line (HL-60). *J. Cell. Physiol.* 163:477-485, 1995.
- Johnson, W.T., Dufault, S.N. and Newman, S.M. Jr. Altered nucleotide content and changes in mitochondrial energy states associated with copper deficiency in rat platelets. *J. Nutr. Biochem.* 6:551-556, 1995.
- Johnson, W.T., LaBerge, T.P. and Sukalski, K.A. Copper deficiency causes *in vivo* oxidative modification of erythrocyte membrane proteins in rats. In: *Trace Elements in Man and Animals - 9: Proceedings of the Ninth International Symposium on Trace Elements in Man and Animals*. P.W.F. Fischer, M.R. L'Abbé, K.A. Cockell, and R.S. Gibson (eds.) NRC Research Press, Ottawa, Canada, pp. 624-25, 1997.
- Sukalski, K.A., LaBerge, T.P. and Johnson, W.T. *In vivo* oxidative modification of erythrocyte membrane proteins in copper deficiency. *Free Rad. Biol. Med.* 22:835-842, 1997.
- Johnson, W.T. and Thomas, A.C. Copper deprivation potentiates oxidative stress in HL-60 cell mitochondria. *Proc. Soc. Exp. Biol. Med.* 221:147-52, 1999.
- Johnson, W.T. Copper and signal transduction: Platelets as a model to determine the role of copper in stimulus-response coupling. *Biofactors* 10:53-59, 1999.
- Johnson, W.T., Thomas, A.C., and Lozano, A.A. Maternal copper deficiency impairs the developmental expression of protein kinase C α , β , and γ isoforms in neonatal rat brain. *Nutritional Neuroscience* 3:113-122, 2000.
- Johnson, W.T. and Prohaska, J.R. Gender influences the effect of perinatal copper deficiency on cerebellar PKC gamma content. *BioFactors* 11:163-169, 2000.
- Davis, C.D. and Johnson, W.T. Dietary copper and dimethylhydrazine affect protein kinase C isozyme protein and mRNA expression and the formation of aberrant crypts in colon of rats. *BioFactors* 15:11-26, 2001.
- Brown-Borg, H., Johnson, W.T., Rakoczy, S. and Romanick, M. Mitochondrial oxidant generation and oxidative damage in Ames dwarf and GH transgenic mice. *J. Amer. Aging Assoc.* 24:85-96, 2001.
- Davis, C.D. and Johnson, W.T. Dietary copper affects azoxymethane-induced intestinal tumor formation and protein kinase C isozyme protein and mRNA expression in colon of rats. *J. Nutr.* 132:1018-1025, 2002.
- Johnson, W.T. and Newman, Jr., Samuel M. Copper deficiency: A potential model for determining the role of mitochondria in cardiac aging. *J. Amer. Aging Assoc.* 26:29-38, 2003.
- Johnson, W.T. and DeMars, L.C.S. Increased heme oxygenase-1 expression during copper deficiency in rats results from increased mitochondrial generation of hydrogen peroxide. *J. Nutr.* 134:1328-1333, 2004.
- Raymond, L.J. and Johnson, W.T. Supplemental ascorbate or α -tocopherol induces cell death in Cu-deficient HL-60 cells. *Exp. Biol. Med.* 229:885-894, 2004.
- Johnson, W.T. Copper and brain function. In: *Nutritional Neuroscience*. H.R. Lieberman, R.B. Kanarek, C. Prasad, eds. CRC Press/Taylor & Francis Group, Boca Raton, FL, p. 289-305, 2005.
- Reeves, P.G., DeMars L.C.S., Johnson, W.T. and Lukaski, H.C. Dietary copper deficiency reduces iron absorption and duodenal enterocyte hephaestin protein in male and female rats. *J. Nutr.* 135:92-98, 2005.
- Johnson, W.T., Johnson, L.K. and Lukaski, H.C. Serum superoxide dismutase 3 (extracellular superoxide dismutase) activity is a sensitive indicator of Cu status in rats. *J. Nutr. Biochem.* 16:682-692, 2005.

Reeves, P.G. and Johnson, W.T. Copper. IN: Driskell, J.A., Wolinsky, I., ed. CRC Press, Taylor & Francis Group, Boca Raton, FL, pp. 235-252, 2005.

Johnson, W.T. and Brown-Borg, H.M. Cardiac cytochrome-c oxidase deficiency occurs during late postnatal development in progeny of copper-deficient rats. *Exp. Biol. Med.* 231:172-180, 2006.

Relling, D.P., Esberg, L.B., Fang, C.X., Johnson, W.T., Murphy, E.J., Carlson, E.C., Saari, J.T. and Ren, J. High-fat diet-induced juvenile obesity leads to cardiomyocyte dysfunction and upregulation of Foxo3a transcription factor independent of lipotoxicity and apoptosis. *J. Hypertension* 24:549-561, 2006.

Saari, J.T., Reeves, P.G., Johnson, W.T. and Johnson, L.K. Pinto beans are a source of highly bioavailable copper in rats. *J. Nutr.* 136: 2999-3004, 2006.

Johnson, W.T. and Newman, Jr., S.M. Hearts in adult offspring of copper-deficient dams exhibit decreased cytochrome c oxidase activity, increased mitochondrial hydrogen peroxide generation and enhanced formation of intracellular residual bodies. *J. Nutr. Biochem.* 18:97-104, 2007.

Zeng, H., Saari, J.T., Johnson, W.T. Copper deficiency decreases complex IV but not complex I, II, III, or V in the mitochondrial respiratory chain in rat heart. *J. Nutr.* 137:14-18, 2007.

Johnson, W.T. and Anderson, C.M. Cardiac cytochrome c oxidase activity and contents of subunits 1 and 4 are altered in offspring by low prenatal copper intake by rat dams. *J. Nutr.* 138:1269-1273, 2008.

Falcone J.C., Lominadze D., Johnson W.T., Schuschke, D.A. Endothelial cell-derived nitric oxide mobilization is attenuated in copper-deficient rats. *Appl. Physiol. Nutr. Metab.* 33:1073-1078, 2008.

Johnson, W.T. and Johnson L.K. Copper deficiency inhibits Ca^{2+} -induced swelling in rat heart mitochondria. *J. Nutr. Biochem.* 20:248-253, 2009.

Zhou, Z., Johnson, W.T., Kang, Y.J. Regression of copper deficient heart hypertrophy: reduction in the size of hypertrophied cardiomyocytes. *J. Nutr. Biochem.* 20:621-628, 2009.

Schuschke, D.A., Adeagbo, A.S.O., Patibandla, P.K., Egbuhuzo, U., Fernandez-Botran, R., Johnson, W.T. Cyclooxygenase-2 is upregulated in copper-deficient rats. *Inflammation* 32:333-339, 2009.

Anderson, C.M. and Johnson, W.T. Maternal copper deficiency perpetuates altered vascular function in Sprague-Dawley rat offspring. *J. Dev. Origins Health Disease* 1:131-140, 2010 .

Brown-Borg, H.M. and Johnson, W.T. Expression of oxidative phosphorylation components in mitochondria of long-living Ames dwarf mice. *Age* 34:43-57, 2012.

Song, M., Schuschke, D.A., Zhou, Z., Chen, T., Pierce, W.M. Jr., Wang, R., Johnson, W.T., and McClain, C.J. *J. Hepatology* 56:433-440, 2012.

ABSTRACTS:

Johnson, W.T., Colilla, W. and Nordlie, R.C. Differential effects of Mg^{2+} on various activities of glucose-6-phosphatase: Some observations and metabolic directive implications. *Proc. N.D. Acad. Sci.* 28:16, 1974.

Johnson, W.T. and Nordlie, R.C. Activity discriminating effects of Cu^{2+} and polyamines on glucose-6-phosphatase-phosphotransferase. *Fed. Proc.* 34:575, 1975.

- Johnson, W.T. Differential effects of Cu^{2+} on synthetic and hydrolytic activities of glucose-6-phosphatase: Mechanistic studies. *Fed. Proc.* 35:1397, 1976.
- Nordlie, R.C., Johnson, W.T., Cornatzer, W.E., Jr. and Twedell, G.W. Effects of polyamines on glucose-6-phosphatase. *Fed. Proc.* 38:630, 1979.
- Johnson, W.T. and Evans, G.W. Copper content of the small intestine of neonatal rats. *Fed. Proc.* 39:902, 1980.
- Nordlie, R.C., Stepanik, P.L., Johnson, W.T. and Jorgenson, R.A. Differential effects of Cr^{3+} , Cu^{2+} , and VO_4^{3-} on glucose-6-phosphatase and glucokinase. *Fed. Proc.* 40:1647, 1981.
- Johnson, W.T., Nordlie, R.C. and Klevay, L.M. Glucose-6-phosphatase activity in copper-deficient rats. *Fed. Proc.* 43:1652, 1984.
- Canfield, W.K., Johnson, W.T., Drain, C., Johnson, L.K. and Klevay, L.M. Changes in red cell carbonic anhydrase activity in men consuming diets of different zinc content. *Clin. Res.* 32:783A, 1984.
- Johnson, W.T. and Canfield, W.K. Effects of dietary zinc and protein on intestinal absorption and excretion of Zn in streptozotocin-diabetic rats. *Fed. Proc.* 44:995, 1985.
- Kramer, T.R., Johnson, W.T., Briske-Anderson, M.J. and Davis, M.A. Copper deficiency and rat spleen lymphocyte biology. *Fed. Proc.* 44:1150, 1985.
- Johnson, W.T. and Canfield, W.K. Effects of endogenous picolinic acid on zinc absorption. *Fed. Proc.* 45:1082, 1986.
- Milne, D.B., Canfield, W.K., Gallagher, S., Johnson, L.K., Johnson, W.T., Klevay, L.M. and Mahalko, J. Effects of marginal zinc intakes on postmenopausal women. *Fed. Proc.* 45:355, 1986.
- Kramer, T.R., Briske-Anderson, M. and Johnson, W.T. Adherent-phagocytic cells influence suppressed concanavalin-A induced proliferation of spleen lymphoid cells in copper deficient rats. *Fed. Proc.* 45:355, 1986.
- Kramer, T.R. and Johnson, W.T. Splenic macrophage and T-lymphocyte function in copper-deficient rats. *Nutrition Regulation of Immunity and Infection, Proceedings of an International Symposium*, 1986.
- Kramer, T.R., Johnson, W.T. and Briske-Anderson, M. Influences of sex and dietary Fe and Cu on proliferation of con-A stimulated spleen lymphoid cells. *Fed. Proc.* 46:441, 1987.
- Johnson, W.T. and Kramer, T.R. Erythrocyte membrane proteins in copper-deficient rats. *Fed. Proc.* 46:2199, 1987.
- Johnson, W.T. and Dufault, S.N. The effect of copper deficiency on the cytoskeletal organization of thrombin-activated rat platelets. *FASEB J.* 2:A1422, 1988.
- Kramer, T.R., Johnson, W.T. and Briske-Anderson, M. Erythrocytes and latex particles cause enhanced in vitro proliferation of con-A stimulated spleen lymphoid cells in copper deficiency. *FASEB J.* 2:A850, 1988.
- Johnson, W.T. and Dufault, S.N. Altered function and cytoskeletal organization of platelets from copper-deficient rats. *J. Cell Biol.* 107:686a, 1988.
- Johnson, W.T. and Dufault, S.N. The duration of copper deficiency affects the protein composition of rat erythrocyte membranes. *FASEB J.* 4:A390, 1990.

- Saari, J.T. and Johnson, W.T. Time course of hematocrit and heart weight changes in dietary copper deficiency. *FASEB J.* 4:A391, 1990.
- Henjum, D., Greeley, S. and Johnson, W.T. Zinc transplacental transfer during late gestation in the rat. *FASEB J.* 4:A962, 1990.
- Johnson, W.T. and Dufault, S.N. The protein kinase C pathway in platelets is perturbed by copper deficiency. *FASEB J.* 4:A1777, 1990.
- Johnson, W.T. and Dufault, S.N. Comparison between the effects of copper and iron deficiency on erythrocyte membrane protein composition and platelet secretory response. *FASEB J.* 5:A548, 1991.
- Johnson, W.T. and Dufault, S.N. Copper deficiency alters intracellular Ca^{2+} flux in rat platelets. *FASEB J.* 6:A1671, 1992.
- Sergeant, S. and Johnson, W.T. HL-60 cells as a cell culture model of functional copper (Cu) deficiency. *FASEB J.* 7:A299, 1993.
- Johnson, W.T. and Dufault, S.N. Platelet cytochrome c oxidase activity is an indicator of copper deficiency. *FASEB J.* 7:A300, 1993.
- Johnson, W.T., Dufault, S.N. and Newman, S.M. Changes in platelet nucleotide content and mitochondrial structure caused by copper deficiency in rats. *FASEB J.* 8:A709, 1994.
- Johnson, W.T., Arya, A. and Sukalski, K.A. Copper deficiency increases hepatic reductase activities. *FASEB J.* 9:A735, 1995.
- Johnson, W.T. and Thomas, A.C. Dietary copper influences the postnatal expression of protein kinase C isoforms. *FASEB J.* 19:A293, 1996.
- Johnson, W.T. and Thomas, A.C. Evidence of oxidative stress in HL60 cells deprived of copper. *FASEB J.* 11:A363, 1997.
- Johnson, W.T. and Lozano, A.A. Maternal copper deficiency alters the distribution of protein kinase C isoforms in neonatal rat brain. *FASEB J.* 12:A200, 1998.
- Johnson, W.T. Effects of copper deficiency and food restriction on cytochrome c oxidase, manganese superoxide dismutase, glutathione peroxidase and protein oxidation in liver and heart mitochondria. *FASEB J.* 13:A571, 1999.
- Johnson, W.T. Copper deficiency does not increase hepatic mitochondrial hydrogen peroxide production. *FASEB J.* 14:A773, 2000.
- Davis, C.D. and Johnson, W.T. Dietary copper and dimethylhydrazine (DMH) affect protein kinase C (PKC) isozyme expression in rat colon. *FASEB J.* 14:A169, 2000.
- Sumner, L.J. and Johnson, W.T. Copper deficiency in HL-60 cells increases their susceptibility to apoptosis when treated with antioxidants. Abstract presented at Frank Low Research Day, April 19, 2001, University of North Dakota.
- Johnson, W.T. Mitochondrial oxidative stress may contribute to the induction of hepatic heme oxygenase-1 in copper deficient rats. *FASEB J.* 15:A271, 2001.

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Fox, E., Davis C.D., Johnson, W.T. Dietary copper but not dietary zinc decreases protein kinase C α expression and dimethylhydrazine-induced aberrant crypt foci formation in the rat colon. *Proc. N.D. Academy of Science* 56:45, 2002.

Johnson, W.T. Oxidative stress resulting from inhibition of the mitochondrial electron transport chain contributes to the induction of hepatic heme oxygenase-1 in copper-deficient rats. *J Nutr* 133(5S-1):203E, 2002.

Johnson, W.T. Changes in respiratory complex activities of heart mitochondria caused by copper deficiency during development in rats are resistant to copper supplementation. *FASEB J.* 17:A378, 2003.

Johnson, W.T., Demars, L.C. Copper deficiency induces heme oxygenase-1 in rat heart and liver. *FASEB J.* 18:A914-A915, 2004.

Johnson, W.T., Lukaski, H.C. Serum superoxide dismutase (SOD) activity is an index of copper status. *FASEB J.* 19(5):A1485, 2005.

Johnson, W.T., Newman, Jr., S.M. Cardiac mitochondrial function is altered in the adult offspring of copper-deficient dams. *FASEB J.* 20(5):A:1065, 2006.

Schuschke DA, Cox J, Johnson WT, Falcone, JC, Copper deficiency attenuates endothelial nitric oxide release. *FASEB J* 21:A721, 2007.

Johnson WT, Anderson CM, Prenatal Cu intake by rat dams is the principle determinant of cardiac cytochrome c oxidase activity in their offspring. *FASEB J* 21:A722, 2007.

Zeng H, Saari JT, Johnson WT, Copper deficiency decreases the protein expression of complex IV but not Complex I, II, III, and IV in mitochondrial respiratory chain in rat heart. *FASEB J* 21:A722, 2007.

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