

## Vita for Stephen Coburn

### Chemical specialty:

Biochemistry

### Research focus:

Examination of the routes and rates of vitamin B-6 metabolism using radioactive tracers in animals and stable isotope tracers in humans followed by mathematical modeling of the data.

Projects active in the fall of 2005 in collaboration with Dr. Ericson:

Analysis of 4-pyridoxic acid (the major end product of vitamin B-6 metabolism in humans) in urine samples provided by NASA.

Analysis of vitamin B-6 compounds in plasma samples from families with hypophosphatasia (a rare genetic disorder of bone metabolism which causes increased concentrations of pyridoxal 5'-phosphate in plasma).

Analysis of vitamin B-6 compounds in the plasma, erythrocytes and urine of normal and autistic children.

### Education:

Rutgers Univ., New Brunswick, NJ	B.S.	1958	Agriculture
Purdue Univ., W. Lafayette, IN	M.S.	1961	Biochemistry
Purdue Univ., W. Lafayette, IN	Ph.D.	1963	Biochemistry

### Experience:

1963-2003: Director, Biochemistry Dept., Fort Wayne State Developmental Center (a residential institution for 300 developmentally disabled individuals)

1964-present: Part-time chemistry teacher at Indiana University-Purdue University at Fort Wayne.  
Current rank: Professor

1989-2003 Director, Clinical Laboratory, Fort Wayne State Developmental Center.

1989-present: Adjunct associate professor of Biochemistry and Molecular Biology, Fort Wayne Center for Medical Education, Indiana University School of Medicine.

1995-present: Member Interdepartmental Nutrition Program faculty, Purdue University, West Lafayette, IN

### Professional certification:

Clinical Chemistry (American Board of Clinical Chemistry)  
Chemical Hygiene Officer(National Registry for Clinical Chemistry)  
Certified Nutrition Specialist (Certification Board for Nutrition Specialists)

### Honors:

Undergraduate:

Alpha Zeta(Agricultural honorary society)

Phi Beta Kappa(Liberal arts honorary society)

Pi Mu Epsilon(Mathematics honorary society)

Scabbard and Blade(Military honorary society)

Graduate:

National Science Foundation Fellowship (1959-1963)

Phi Lambda Upsilon(Chemistry honorary society)

Sigma Xi(Research honorary society)

Post-graduate:

1968 Chemist of the Year (Northeastern Indiana Section, American Chemical Society)

1980 Distinguished Service Award (Indiana State Commission for the Handicapped)

1983 Fellow (American Association on Mental Retardation)

1994 Life member (American Association on Mental Retardation)

1995 Chemist of the Year (Northeastern Indiana Section, American Chemical Society)

1999 Osborne and Mendel Award for outstanding nutrition research(American Society for Nutritional Sciences)

Professional Memberships:

American Association for the Advancement of Science

American Association for Clinical Chemistry

American Association on Mental Retardation

American Chemical Society

American Society for Nutritional Sciences

Biochemical Society

Indiana Academy of Sciences

New York Academy of Sciences

Journal Articles, Book Chapters and Books:

1. Coburn SP, Packett LV. Calcium, phosphorus, and citrate interactions in oxalate urolithiasis produced with a low phosphorus diet in rats. *J Nutr* 1962;76:386-92.
2. Packett LV, Coburn SP. The effect of ration and urolithiasis on serum protein fractions of sheep. *Am J Vet Res* 1964;25:1508-11.
3. Coburn SP, Luce MW, Mertz ET. Elevated levels of several nitrogenous non-protein metabolites in mongoloid blood. *Am J Ment Defic* 1965;69:814-7.
4. Packett LV, Coburn SP. Urine proteins in nutritionally induced ovine urolithiasis. *Am J Vet Res* 1965;26:112-9.
5. Coburn SP, Seidenberg M, Mertz ET. Clearance of uric acid, urea, and creatinine in Down's syndrome. *J Appl Physiol* 1967;23:579-80.
6. Coburn SP, Seidenberg M, Smith CE, Mertz ET. Non-protein nitrogenous metabolites in saliva in Down's syndrome. *J Dental Res* 1967;46:1467.

7. Coburn SP, Sirlin EM, Mertz ET. Metabolism of <sup>15</sup>N labeled uric acid in Down's syndrome. *Metabolism* 1968;17:560-2.
8. Coburn SP, Seidenberg M, Fuller RW. Daily rhythm in plasma tyrosine and phenylalanine. *Proc Soc Exp Biol Med* 1968;129:338-43.
9. Coburn SP, Seidenberg M. Leukocyte pyridoxal phosphate and alkaline phosphatase in Down's syndrome and other retardates. *Am J Clin Nutr* 1969;22:1197-203.
10. Coburn SP, Mahuren JD, Fuller RW. An improved method for measuring blood concentrations of phenylpyruvic acid. *Clin Chem* 1971;17:378-81.
11. Fuller RW, Snoddy HD, Wolen RL, Coburn SP, Sirlin EM. Effect of glucagon and p-chlorophenylalanine on hepatic enzymes that metabolize phenylalanine. *Adv Enz Regul* 1972;10:153-67.
12. Coburn SP, Schaltenbrand WE, Clausman RJ, Pauly EM, deLesstine H. Use of a low protein diet based on high lysine corn in the management of phenylketonuria. *Nutr Rep Int* 1973;7:229-39.
13. Culley W, Chilko J, Coburn SP. Body water content of boys with Down's syndrome. *J Ment Def Res* 1974;18:25-9.
14. Mahuren JD, Coburn SP. Pyridoxal phosphate in lymphocytes, polymorphonuclear leukocytes and platelets in Down's syndrome. *Am J Clin Nutr* 1974;27:521-7.
15. Coburn SP, Gruemer HD, Hodges JM. Pentose cycle in leukocytes. *Clin Chem* 1975;21:8.
16. Coburn SP, Mahuren JD, Sallay SI. In vivo metabolism of 4'-deoxyripyridoxine in rat and man. *J Biol Chem* 1976;251:1646-52.
17. Mahuren JD, Coburn SP. Separation of seven B-6 vitamers by two-dimensional thin-layer chromatography. *Anal Biochem* 1977;82:246-9.
18. Coburn SP, Mahuren JD, Schaltenbrand WE, Sallay SI. Identification of 5'-deoxyripyridoxine-3-sulfate as the major urinary metabolite of 5'-deoxyripyridoxine in rats with comments on the inhibition of arylsulfatase activity and manganese oxidation by neighboring groups. *Biochem Biophys Res Commun* 1978;80:942-8.
19. Coburn SP, Mahuren JD, Schaltenbrand WE, Sallay SI. Identification of 5'-deoxyripyridoxine-3-sulfate as the major urinary metabolite of 5'-deoxyripyridoxine in rats with comments on the inhibition of arylsulfatase activity and manganese dioxide oxidation by neighboring groups. *Biochem Biophys Res Commun* 1978;80:942-8.
20. Coburn SP, Schaltenbrand WE. Simplified preparation of a phosphatase inhibitor and further studies of its action. *Biochem J* 1978;171:485.

21. Coburn SP, Schaltenbrand WE, Leykauf RE, Bendixen GE, Townsend DW. Decreased erythrocyte fragility in Black Americans. *IRCS Med Sci* 1979;7:240.
22. Coburn SP, Mahuren JD. Major urinary metabolites of 4'- and 5'-deoxypyridoxines in various species. *IRCS Med Sci* 1979;7:556.
23. Coburn SP. Non-treatment of defective newborn babies. *Lancet* 1980;1:102.
24. Coburn SP, Leykauf RE, Bader PI, Palmer CG. Cytogenetic survey of residents of the Fort Wayne State Hospital and Training Center. *IRCS Med Sci* 1980;8:664-5.
25. Coburn SP, Mahuren JD, Schaltenbrand WE, Wostmann BS, Madsen D. Effects of vitamin B-6 deficiency and 4'- deoxypyridoxine on pyridoxal phosphate concentrations, pyridoxine kinase and other aspects of metabolism in the rat. *J Nutr* 1981;111:391-8.
26. Coburn SP, Mahuren JD, Schaltenbrand WE, Wostmann BS, Madsen D. Effects of vitamin B-6 deficiency and 4'-deoxypyridoxine on pyridoxal phosphate concentrations, pyridoxine kinase and other aspects of metabolism in the rat. *J Nutr* 1981;111:391-8.
27. Coburn SP. *The Chemistry and Metabolism of 4'-Deoxypyridoxine*. Boca Raton, FL: CRC Press, Inc., 1981.
28. Coburn SP, Lin CC, Schaltenbrand WE, Mahuren JD. Synthesis of deuterated vitamin B-6 compounds. *J Labelled Compd Radiopharm* 1982;19:703-16.
29. Coburn SP. More on contaminated water purification cartridges. *Clin Chem* 1983;29:1872.
30. Coburn SP, Mahuren JD. A versatile cation-exchange procedure for measuring the seven major forms of vitamin B-6 in biological samples. *Anal Biochem* 1983;129:310-7.
31. Coburn SP, Schaltenbrand WE, Mahuren JD, Clausman RJ, Townsend DW. Effect of megavitamin treatment on mental performance and plasma vitamin B-6 concentrations in mentally retarded young adults. *Am J Clin Nutr* 1983;38:352-5.
32. Coburn SP, Mahuren JD, Erbelding WF, Townsend DW, Hachey DL, Klein PD. Measurement of vitamin B-6 kinetics in vivo using chronic administration of labelled pyridoxine. In: Evangelopoulos AE, ed. *Chemical and Biological Aspects of Vitamin B-6 Catalysis, Part A*. New York: Alan R. Liss, Inc. 1984:43-54.
33. Coburn SP, Mahuren JD, Guilarte TR. Vitamin B-6 content of plasma of domestic animals determined by HPLC, enzymatic and radiometric microbiologic methods. *J Nutr* 1984;114:2269-73.
34. Coburn SP. Metabolic and clinical studies of vitamin B-6 in mental disorders. In: Leklem JE, Reynolds RD, eds. *Vitamin B-6: Its Role in Health and Disease*. New York: Alan R. Liss, Inc. 1985:123-59.

35. Coburn SP, Mahuren JD, Szadkowska Z, Schaltenbrand WE, Townsend DW. Kinetics of vitamin B-6 metabolism examined in miniature swine by continuous administration of labelled pyridoxine. In: Canolty NL, Cain TP, eds. *Mathematical Models in Experimental Nutrition*. Athens: University of Georgia 1985:99-111.
36. Coburn SP. Chromatographic analysis of vitamin B-6 and derivatives. In: Dolphin D, Poulson R, Avramovic O, eds. *Vitamin B-6: Pyridoxal Phosphate: Chemical, Biochemical and Medical Aspects*. New York: Wiley 1985:497-544.
37. Hachey DL, Coburn SP, Brown LT, Erbedling WF, DeMark B, Klein PD. Quantitation of vitamin B-6 in biological samples by isotope dilution mass spectrometry. *Anal Biochem* 1985;151:159-68.
38. Schaltenbrand WE, Coburn SP. Determination of phenol and p-cresol in urine. *Clin Chem* 1985;31:2042-3.
39. Whyte MP, Mahuren JD, Vrabel LA, Coburn SP. Markedly increased circulating pyridoxal 5'-phosphate levels in hypophosphatasia. *J Clin Invest* 1985;76:752-6.
40. Coburn SP. Chromatographic analysis of vitamin B-6 derivatives. In: Dolphin D, Poulson R, Avramovic O, eds. *Vitamin B-6*. New York: John Wiley & Sons 1986:497-544.
41. Coburn SP, Mahuren JD. Cation-exchange high-performance liquid chromatographic analysis of vitamin B-6. *Meth Enzymol* 1986;122:102-10.
42. Cole DEC, Stinson RA, Coburn SP, Ryan LM, Whyte MP. Increased serum pyridoxal 5'-phosphate in pseudohypophosphatasia. *N Engl J Med* 1986;314:992-3.
43. Coburn SP, Mahuren JD. Identification of pyridoxine 3-sulfate, pyridoxal 3-sulfate and N-methylpyridoxine as major urinary metabolites of vitamin B-6 in domestic cats. *J Biol Chem* 1987;262:2642-4.
44. Schaltenbrand WE, Kennedy MS, Coburn SP. Low ultraviolet white fluorescent lamps fail to protect pyridoxal phosphate from photolysis. *Clin Chem* 1987;33:631-2.
45. Coburn SP, Townsend DW. A multicompartment model of vitamin B-6 metabolism. *Prog Food Nutr Sci* 1988;12:227-42.
46. Coburn SP, Whyte MP. Role of phosphatases in the regulation of vitamin B-6 metabolism in hypophosphatasia and other disorders. In: Leklem JE, Reynolds RD, eds. *Clinical and Physiological Applications of Vitamin B-6*. New York: Alan R. Liss 1988:65-93.
47. Coburn SP, Mahuren JD, Kennedy MS, Schaltenbrand WE, Sampson DA, O'Connor DK, Snyder DL, Wostmann BS. B-6 vitamers content of rat tissues measured by isotope tracer and chromatographic methods. *BioFactors* 1988;1:307-12.

48. Coburn SP, Lewis DN, Fink WJ, Mahuren JD, Schaltenbrand WE, Costill DL. Human vitamin B-6 pools estimated through muscle biopsies. *Am J Clin Nutr* 1988;48:291-4.
49. Whyte MP, Mahuren JD, Fedde KN, Cole FS, McCabe ER, Coburn SP. Perinatal hypophosphatasia: Tissue levels of vitamin B-6 are unremarkable despite markedly increased circulating concentrations of pyridoxal 5'-phosphate. *J Clin Invest* 1988;81:1234-9.
50. Coburn SP, Mahuren JD, Wostmann BS, Snyder DL, Townsend DW. Role of intestinal microflora in the metabolism of vitamin B-6 and 4'-deoxypyridoxine examined using germfree guinea pigs and rats. *J Nutr* 1989;119:181-8.
51. Coburn SP, Townsend DW. Modelling vitamin B-6 metabolism in rodents. *In Vivo* 1989;3:215-24.
52. Chodirker BN, Coburn SP, Seargeant LE, Whyte MP, Greenberg CR. Increased plasma pyridoxal 5'-phosphate levels before and after pyridoxine loading in carriers of perinatal/infantile hypophosphatasia. *J Inher Metab Dis* 1990;13:891-6.
53. Coburn SP. Location and turnover of vitamin B-6 pools and vitamin B-6 requirements of humans. *Ann N Y Acad Sci* 1990;585:76-85.
54. Mahuren JD, Coburn SP. B-6 vitamers: cation exchange HPLC. *J Nutr Biochem* 1990;1:659-63.
55. Coburn SP, Mahuren JD, Schaltenbrand WE. Increased activity of pyridoxal kinase in tongue in Down's syndrome. *J Ment Def Res* 1991;35:543-7.
56. Coburn SP, Ziegler PJ, Costill DL, Mahuren JD, Fink WJ, Schaltenbrand WE, Pauly TA, Pearson DR, Conn PS, Guilarte TR. Response of vitamin-B-6 content of muscle to changes in vitamin B-6 intake in men. *Am J Clin Nutr* 1991;53:1436-42.
57. Mahuren JD, Pauly TA, Coburn SP. Identification of 5-pyridoxic acid and 5-pyridoxic acid lactone as metabolites of vitamin B-6 in humans. *J Nutr Biochem* 1991;2:449-53.
58. Coburn SP. Application of models to the determination of nutrient requirements: An overview. *J Nutr* 1992;122:687-9.
59. Coburn SP, Mahuren JD, Pauly TA, Ericson KL, Townsend DW. Alkaline phosphatase activity and pyridoxal phosphate concentrations in the milk of various species. *J Nutr* 1992;122:2348-53.
60. Coburn SP, Mahuren JD, Kennedy MS, Schaltenbrand WE, Townsend DW. Metabolism of [<sup>14</sup>C]- and [<sup>32</sup>P]pyridoxal 5'-phosphate and [<sup>3</sup>H]pyridoxal administered intravenously to pigs and goats. *J Nutr* 1992;122:393-401.
61. Coburn SP. Symposium: Application of models to determination of nutrient requirements. *J Nutr* 1992;122:687-714.

62. Schenker S, Johnson RF, Mahuren JD, Henderson GI, Coburn SP. Human placental vitamin B-6 (pyridoxal) transport - normal characteristics and effects of ethanol. *Am J Physiol* 1992;262:R966-R974.
63. Coburn SP. A critical review of minimal vitamin B-6 requirements for growth in various species with a proposed method of calculation. *Vitam Horm* 1994;48:259-300.
64. Coburn, S. P. Vitamin B-6. *NRI Research Highlights* 1995(1). 1995. Washington, DC, U.S. Dept. of Agriculture.  
Ref Type: Magazine Article
65. Coburn SP, Thampy KG, Lane HW, Conn PS, Ziegler PJ, Costill DL, Mahuren JD, Fink WJ, Pearson DR, Schaltenbrand WE, Pauly TA, Townsend DW, LeBlanc AD, Smith SM. Pyridoxic acid excretion during low vitamin B-6 intake, total fasting, and bed rest. *Am J Clin Nutr* 1995;62:979-83.
66. Coburn SP. Animal and mathematical models of vitamin B-6 metabolism. In: Raiten DJ, ed. *Vitamin B-6 Metabolism in Pregnancy, Lactation, and Infancy*. Boca Raton, FL: CRC Press 1995:61-75.
67. Massé PG, Yamauchi M, Mahuren JD, Coburn SP, Muniz OE, Howell DS. Connective tissue integrity is lost in vitamin B-6 deficient chicks. *J Nutr* 1995;125:26-34.
68. Schaeffer MC, Gretz D, Mahuren JD, Coburn SP. Tissue vitamer concentrations in rats fed excess vitamin B-6. *J Nutr* 1995;125:2370-8.
69. Waymire KG, Mahuren JD, Jaje JM, Guilarte TR, Coburn SP, MacGregor GR. Mice lacking tissue non-specific alkaline phosphatase die from seizures associated with defective metabolism of vitamin B-6. *Nature Genet* 1995;11:45-51.
70. Whyte MP, Landt M, Ryan LM, Mulivor RA, Henthorn PS, Fedde KN, Coburn SP. Alkaline phosphatase:placental and tissue nonspecific isoenzymes hydrolyze phosphoethanolamine, inorganic pyrophosphate, and pyridoxal 5'-phosphate(substrate accumulation in carriers of hypophosphatasia corrects during pregnancy). *J Clin Invest* 1995;95:1440-5.
71. Beynon RJ, Leyland DM, Evershed RP, Edwards RHT, Coburn SP. Measurement of the turnover of glycogen phosphorylase by GC/MS using stable isotope derivatives of pyridoxine (vitamin B-6). *Biochem J* 1996;317:613-9.
72. Beynon RJ, Bartram C, Flannery AV, Evershed RP, Leyland DM, Hopkins P, Toescu V, Phoenix J, Edwards RHT. Interrelationships between metabolism of glycogen phosphorylase and pyridoxal phosphate - implications in McArdle's disease. *Adv Food Nutr Res* 1996;40:135-47.
73. Coburn SP. Standardization of nutritional-status terminology. *Am J Clin Nutr* 1996;63:139-40.

74. Coburn SP. Modeling vitamin B-6 metabolism. *Adv Food Nutr Res* 1996;40:107-32.
75. Coburn SP, Townsend DW, eds. *Mathematical Modeling in Experimental Nutrition*. New York: Academic Press, 1996.
76. Dubeski PL, Owens FN, Song WO, Coburn SP, Mahuren JD. Effects of B vitamin injections on plasma B vitamin concentrations of feed-restricted beef calves infected with bovine herpesvirus- 1. *J Anim Sci* 1996;74:1358-66.
77. Massé PG, Rimmac CM, Yamauchi M, Coburn SP, Rucker RB, Howell DS, Boskey AL. Pyridoxine deficiency affects biomechanical properties of chick tibial bone. *Bone* 1996;18:567-74.
78. Mahuren JD, Coburn SP. Determination of 5-pyridoxic acid, 5-pyridoxic acid lactone, and other vitamin B<sub>6</sub> compounds by cation-exchange high- performance liquid chromatography. *Meth Enzymol* 1997;280:22-9.
79. Schenker S, Coburn SP. Pyridoxal 5'-phosphate transfer in human placenta. *Am J Clin Nutr* 1997;65:1571.
80. Coburn SP, Mahuren JD, Jain M, Zubovic Y, Wortsman J. Alkaline phosphatase (EC 3.1.3.1) in serum is inhibited by physiological concentrations of inorganic phosphate. *J Clin Endocrinol Metab* 1998;83:3951-7.
81. Fedde KN, Blair L, Silverstein J, Coburn SP, Ryan LM, Weinstein RS, Waymire K, Narisawa S, Millán JL, MacGregor GR, Whyte MP. Alkaline phosphatase knock-out mice recapitulate the metabolic and skeletal defects of infantile hypophosphatasia. *J Bone Min Res* 1999;14:2015-26.
82. Mahuren JD, Dubeski PL, Cook NJ, Schaefer AL, Coburn SP. Adrenocorticotrophic hormone increases hydrolysis of B-6 vitamers in swine adrenal glands. *J Nutr* 1999;129:1905-8.
83. Moore CA, Curry CJR, Henthorn PS, Smith JK, Smith JC, O'Lague P, Coburn SP, Weaver DD, Whyte MP. Mild autosomal dominant hypophosphatasia: In utero presentation in two families. *Am J Med Genet* 1999;86:410-5.
84. Coburn SP. Vitamin B-6. In: Song WO, Beecher GR, Eitenmiller RR, eds. *Modern Analytical Methodologies in Fat- and Water-Soluble Vitamins*. New York: Wiley 2000:291-311.
85. Volpe SL, King JC, Coburn SP. Micronutrients: Trace elements and B vitamins. In: Lane HL, Schoeller DA, eds. *Nutrition in Space Flight and Weightlessness Models*. Boca Raton, FL: CRC Press 2000:213-32.
86. Mahuren JD, Coburn SP, Slominski A, Wortsman J. Microassay of phosphate provides a general method for measuring the activity of phosphatases using physiological,

- nonchromogenic substrates such as lysophosphatidic acid. *Anal Biochem* 2001;298:241-5.
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  88. Coburn SP, Reynolds RD, Mahuren JD, Schaltenbrand WE, Wang Y, Ericson KL, Whyte MP, Zubovic YM, Ziegler PJ, Costill DL, Fink WJ, Pearson DR, Pauly TA, Thampy KG, Wortsman J. Elevated plasma 4-pyridoxic acid in renal insufficiency. *Am J Clin Nutr* 2002;75:57-64.
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  91. Coburn SP, Townsend DW, Ericson KL, Reynolds RD, Ziegler PJ, Costill DL, Mahuren JD, Schaltenbrand WE, Pauly TA, Wang Y, Fink WJ, Pearson DR, Hachey DL. Modeling short(7h)-and long(6wk)-term kinetics of vitamin B-6 metabolism with stable isotopes in humans. *Adv Exp Med Biol* 2003;537:173-92.
  92. Coburn SP, Slominski A, Mahuren JD, Wortsman J, Hessle L, Millan JL. Cutaneous metabolism of vitamin B-6. *J Invest Dermatol* 2003;120:292-300.
  93. Whyte MP, Kurtzberg J, McAlister WH, Mumm S, Podgornik MN, Coburn SP, Ryan LM, Miller CR, Gottesman GS, Smith AK, Douville J, Waters-Pick B, Armstrong RD, Martin PL. Marrow cell transplantation for infantile hypophosphatasia. *J Bone Miner Res* 2003;18:624-36.
  94. Bach S, Knockaert M, Reinhardt J, Lozach O, Schmitt S, Baratte B, Koken M, Coburn SP, Tang L, Jiang T, Liang DC, Galons H, Dierick JF, Pinna LA, Meggio F, Totzke F, Schachtele C, Lerman AS, Carnero A, Wan Y, Gray N, Meijer L. Roscovitine targets: protein kinases and pyridoxal kinase. *J Biol Chem* 2005.
  95. Ericson KL, Mahuren JD, Zubovic YM, Coburn SP. Use of chlorite to improve HPLC detection of pyridoxal 5'-phosphate. *J Chromatogr B* 2005;823:218-20.
  96. Massé PG, Dosy J, Cole DEC, Evrovski J, Mahuren JD, Coburn SP. Elevation of plasma homocysteine in natural menopause cannot be explained by a lack of vitamin coenzyme availability: relevance to cardiovascular disease. *J Nutr Health Aging* 2005;9:59-64.