9. REFERENCES

Abernethy DJ, Couch DB. 1982. Cytotoxicity and mutagenicity of dinitrotoluenes in Chinese hamster ovary cells. Mutat Res 103:53-59.

ACGIH. 2014. Dinitrotoluene. In: TLVs and BEIs based on the documentation of the threshold limit values for chemical substances and physical agents and biological exposure indices. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 28, 72-77.

Adlercreutz H. 1995. Phytoestrogens: Epidemiology and a possible role in cancer protection. Environ Health Perspect Suppl 103(7):103-112.

Agency for Toxic Substances and Disease Registry. 1989. Decision guide for identifying substance-specific data needs related to toxicological profiles; Notice. Agency for Toxic Substances and Disease Registry, Division of Toxicology. Fed Regist 54(174):37618-37634.

Agency for Toxic Substances and Disease Registry. 2009. Public health assessments and health consultations. Joliet Army Ammunition Plant (Manufacturing Area) and Joliet Army Ammunition Plant (Lap Area), Joliet, Will County, Illinois. http://www.atsdr.cdc.gov/HAC/pha/pha.asp?docid=558&pg=1. April 15, 2015.

Agency for Toxic Substances and Disease Registry. 2013. ATSDR case studies in environmental medicine. Nitrate/nitrite toxicity. Atlanta, GA: Agency for Toxic Substances and Disease Registry. U.S. Department of Health and Human Services. http://www.atsdr.cdc.gov/csem/nitrate_2013/docs/nitrite.pdf. May 20, 2014.

AIChE. 1992. 3,5-Dinitrotoluene. C7H6N204. In: Physical and thermodynamic properties of pure chemicals. American Institute of Chemical Engineers, Design Institute for Physical Property Data. Philadelphia, PA: Taylor and Francis.

AIHA. 2014. Current ERPG Values (2014). Fairfax, VA: American Industrial Hygiene Association. https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Documents/2014%20ERPG%20Values.pdf. March 4, 2015.

Albert KJ, Walt DR. 2000. High-speed fluorescence detection of explosives-like vapors. Anal Chem 72(9):1947-1955.

Altman PL, Dittmer DS. 1974. Biological handbooks: Biology data book. Vol. III. 2nd ed. Bethesda, MD: Federation of American Societies for Experimental Biology, 1987-2008, 2041.

Altschuh J, Brüggemann R, Santi H, et al. 1999. Henry's law constants for a diverse set of organic chemicals: Experimental determination and comparison of estimation methods. Chemosphere 39(11):1871-1887.

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* Not cited in text

9. REFERENCES

Andersen ME, Krishnan K. 1994. Relating *in vitro* to *in vivo* exposures with physiologically based tissue dosimetry and tissue response models. In: Salem H, ed. Animal test alternatives: Refinement, reduction, replacement. New York, NY: Marcel Dekker, Inc., 9-25.

Andersen ME, Clewell HJ, Gargas ML, et al. 1987. Physiologically based pharmacokinetics and the risk assessment process for methylene chloride. Toxicol Appl Pharmacol 87(2):185-205.

Ashby J, Burlinson B, Lefevre PA, et al. 1985. Non genotoxicity of 2,4,6-trinitrotoluene (TNT) to the mouse bone marrow and the rat liver: Implications for its carcinogenicity. Arch Toxicol 58:14-19.

Atkinson R, Carter WPL, Darnall KR, et al. 1980. A smog chamber and modeling study of the gas phase nitrogen oxides air photo-oxidation of toluene and the cresols. Int J Chem Kinet 12:779-836.

Banerjee HN, Verma M, Hou LH, et al. 1999. Cytotoxicity of TNT and its metabolites. Yale J Biol Med 72(1):1-4.

Barnes DG, Dourson M. 1988. Reference dose (RfD): Description and use in health risk assessments. Regul Toxicol Pharmacol 8(4):471-486.

Bauer CF, Koza SM, Jenkins TF. 1990. Liquid chromatographic method for determination of explosives residues in soil: Collaborative study. J Assoc Off Anal Chem 73:541-552.

Bausum HT, Mitchell WR, Major MA. 1992. Biodegradation of 2,4- and 2,6-dinitrotoluene by freshwater microorganisms. J Environ Sci Health A27:663-695.

Bentur Y, Keyes DC. 2004. Explosives. In: Dart RC, ed. Medical Toxicology. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins, 1258-1279.

Berger GS, ed. 1994. Epidemiology of endometriosis. In: Endometriosis: Advanced management and surgical techniques. New York, NY: Springer-Verlag, 3-7.

Bloch E, Gondos B, Gatz M, et al. 1988. Reproductive toxicity of 2,4-dinitrotoluene in the rat. Toxicol Appl Pharmacol 94:466-472.

Bond JA, Medinsky MA, Dent JG, et al. 1981. Sex dependent metabolism and biliary excretion of carbon-14 labeled dinitrotoluene in isolated perfused rat livers. J Pharmacol Exp Ther 219:598-603.

Bond JA, Rickert DE. 1981. Metabolism of 2,4-dinitrotoluene by freshly isolated Fischer-344 rat primary hepatocytes. Drug Metab Dispos 9:10-14.

Bradley PM, Chapelle FH, Landmeyer JE et al. 1994. Microbial transformation of nitroaromatics in surface soils and aquifer materials. Appl Environ Microbiol 60:2170-2175.

Bruning T, Chronz C, Thier R, et al. 1999. Occurrence of urinary tract tumors in miners highly exposed to dinitrotoluene. J Occup Environ Med 41(3):144-149.

Brüning T, Thier R, Mann H. et al. 2001. Pathological excretion patterns of urinary proteins in miners highly exposed to dinitrotoluene. J Occup Environ Med 43(7):610-615.

9. REFERENCES

Callahan MA, Slimak MW, Gabel N, et al. 1979. Water-related environmental fate of 129 priority pollutants. Volume II. Washington, DC: Monitoring and Data Support Division (WH-553), U.S. Environmental Protection Agency. EPA440479029b. PB80204381, 81-1 to 82-8.

Camanzo J, Rice CP, Jude DG, et al. 1987. Organic priority pollutants in nearshore fish from 14 Lake Michigan (USA) tributaries and embayments, 1983. J Great Lakes Res 13:296-309.

Campbell S, Ogoshi R, Uehara G, et al. 2003. Trace analysis of explosives in soil: Pressurized fluid extraction and gas and liquid chromatography-mass spectrometry. J Chromatogr Sci 41(6):284-288.

Chadwick RW, George SE, Chang J, et al. 1990. Comparative gastrointestinal enzyme activity and activation of the promutagen 2,6-dinitrotoluene in male CD-1 mice and male Fischer 344 rats. Cancer Lett 52:13-19.

Chadwick RW, George SE, Kohan MJ, et al. 1993. Potentiation of 2,6-dinitrotoluene genotoxicity in Fischer-344 rats by pretreatment with Aroclor 1254. Toxicology 80:153-171.

Chapman DE, Michener SR, Powis G. 1993. *In vitro* metabolism of [^{3}H]2,6-dinitrotoluene by human and rat liver. Toxicol in Vitro 7(3):213-220.

Cheng J, Kanjo Y, Suidan MT, et al. 1996. Anaerobic biotransformation of 2,4-dinitrotoluene with ethanol as primary substrate: Mutual effect of the substrates on their biotransformation. Water Research 30:307-314.

Cheng J, Suldan MT, Venosa AD. 1995. Anaerobic biotransformation of 2,4-dinitrotoluene with different primary substrates. Proceedings - Water and Environmental Federation Annual Conference 68th, 99-109.

Chiu CW, Lee LH, Wang CY, et al. 1978. Mutagenicity of some commercially available nitro compounds for *Salmonella typhimurium*. Mutat Res 58:11-22.

Clewell HJ, Andersen ME. 1985. Risk assessment extrapolations and physiological modeling. Toxicol Ind Health 1(4):111-131.

CMA. 1991. Initial submission from Chemical Manufacturers Association to U.S. EPA submitting information on 2,6-dinitrotoluene acute (6-hour) inhalation toxicity study in rats with attachments. Chemical Manufacturers Association. NTIS OTS0533663.

Content S, Trogler WC, Sailor MJ. 2000. Detection of nitrobenzene, DNT, and TNT vapors by quenching of porous silicon photoluminescence. Chemistry 6(12):2205-2213.

Costa LG, Aschner M, Vitalone A, et al. 2004. Developmental neuropathology of environmental agents. Annu Rev Pharmacol Toxicol 44: 87-110.

Couch DB, Allen PF, Abernethy DJ. 1981. The mutagenicity of dinitrotoluenes in *Salmonella typhimurium*. Mutat Res 90:373-383.

Currance PL, Clements B, Bronstein AC. 2007. Dinitrophenol and related compounds. In: Emergency care for hazardous materials exposure. St. Louis, MO: Mosby Jems, 335-338.

9. REFERENCES

Dellarco VL, Prival MJ. 1989. Mutagenicity of nitro compounds in *Salmonella typhimurium* in the presence of flavin mononucleotide in a preincubation assay. Environ Mol Mutagen 13:116-127.

Deng Y, Meyer SA, Guan X, et al. 2011. Analysis of common and specific mechanisms of liver function affected by nitrotoluene compounds. PLoS One 6(2):e14662.

Deroux JM, Gonzalez C, Le Cloirec P, et al. 1996. Analysis of extractable organic compounds in water by gas chromatography mass spectrometry: Applications to surface water. Talanta 43:365-380.

De Vault DS. 1985. Contaminants in fish from Great Lakes harbors and tributary mouths. Arch Environ Contam Toxicol 14:587-594.

Dillert R, Brandt M, Fornefett I, et al. 1995. Photocatalytic degradation of trinitrotoluene and other nitroaromatic compounds. Chemosphere 30:2333-2341.

DOE. 2012a. Table 3: PACs by CASRN (pdf). PAC Rev 27 Tables - PAC data and chemical properties presented in pdf and excel tables. Protective Action Criteria (PAC) with AEGLs, ERPGs, & TEELs: Rev. 27 for chemicals of concern - March 2012. Oak Ridge, TN: U.S. Department of Energy. http://energy.gov/ehss/protective-action-criteria-pac-aegls-erpgs-teels-rev-27-chemicals-concern-march-2012. March 4, 2015.

DOE. 2012b. Protective action criteria (PAC): Chemicals with AEGLs, ERPGs, & TEELs. Definition of PACs (AEGLs, ERPGs or TEELs). Protective Action Criteria (PAC) with AEGLs, ERPGs, & TEELs: Rev. 27 for Chemicals of Concern - March 2012. Oak Ridge, TN: U.S. Department of Energy. http://energy.gov/ehss/protective-action-criteria-pac-aegls-erpgs-teels-rev-27-chemicals-concern-march-2012. March 24, 2015.

Dunkel VC, Zeiger E, Brusik D, et al. 1985. Reproducibility of microbial mutagenicity assays: II. Testing of carcinogens and noncarcinogens in *Salmonella typhimurium* and *Escherichia coli*. Environ Mutagen 7:1-248.

Einistö P, Watanabe M, Ishidate M Jr., et al. 1991. Mutagenicity of 30 chemicals in *Salmonella typhimurium* strains possessing different nitroreductase or O-acetyltransferase activities. Mutat Res 259:95-102.

Ek CJ, Dziegielewska KM, Habgood MD, et al. 2012. Barriers in the developing brain and neurotoxicology. Neurotoxicology 33(3):586-604.

Ellis HV, Hong CB, Lee CC, et al. 1985. Subchronic and chronic toxicity studies of 2,4-dinitrotoluene. Part I. Beagle dog. J Am Coll Toxicol 4:233-242.

Emmrich M, Kaiser M, Rueden H, et al. 1993. Determination of RDX, 2,4,6-trinitrotoluene and other nitroaromatic compounds by high-performance liquid chromatography with photodiode-array detection. J Chromatogr 645:89-94.

Engelhardt G, Schwind KR, Mussler B. 2004. The testing of chemicals in the Syrian hamster embryo (SHE) cell transformation assay for assessment of carcinogenic potential. Toxicol in Vitro 18(2):213-218.

9. REFERENCES

EPA. 1979. Evaluation of the ultraviolet-ozone and ultraviolet-oxidant treatment of pink water. Cincinnati, OH: U.S. Environmental Protection Agency, Office of Research and Development, Industrial Environmental Research Laboratory. EPA600279129. PB300763.

EPA. 1980. Semivolatile organic compounds by isotope dilution GC-IDMS-method 1625. U.S. Environmental Protection Agency.

EPA. 1982a. Nitroaromatics and isophorone-method 609. Methods for organic chemical analysis of municipal and industrial wastewater. Cincinnati, OH: U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory, 609-1 to 609-8.

EPA. 1982b. Base/neutrals and acids-method 625. Methods for organic chemical analysis of municipal and industrial wastewater. Cincinnati, OH: U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory, 625-1 to 625-19.

EPA. 1982c. Aquatic fate process data for organic priority pollutants. U.S. Environmental Protection Agency. EPA440481014. PB87169090.

EPA. 1986a. Nitroaromatics and cyclic ketones-method 8090. In: Test methods for evaluating solid wastes, SW-846. 3rd ed. Washington, DC: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 8090-1 to 8090-15.

EPA. 1986b. Gas chromatography/mass spectrometry for semivolatile organics: Capillary column technique-method 8270. In: Test methods for evaluating solid wastes, SW-846. 3rd ed. Washington, DC: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 8270-1 to 8270-32.

EPA. 1986c. Capillary column analysis of semivolatile organic compounds by gas chromatography/Fourier transform infrared (GC/FT-IR) spectrometry-method 8410. In: Test methods for evaluating solid wastes, SW-846. 3rd ed. Washington, DC: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 8410-1 to 8410-17.

EPA. 1989. Method 1624: Volatile organic compounds by isotope dilution GCMS; Method 1625: Semivolatile organic compounds by isotope dilution GCMS. U.S. Environmental Protection Agency, Office of Water Regulations and Standards, Industrial Technology Division. EPA440189023.

EPA. 1990. Interim methods for development of inhalation reference concentrations. Washington, DC: U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Office of Research and Development, Environmental Criteria and Assessment Office. EPA600890066A.

EPA. 1992. Health advisory for 2,4- and 2,6-dinitrotoluene (DNT). Washington, DC: U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Health and Ecological Criteria Division. PB92189315.

EPA. 1995. Health effects assessment summary tables. Washington, DC: U.S. Environmental Protection Agency, Office of Research and Development, Office of Emergency and Remedial Response. EPA540R95036. PB95921199.

EPA. 1996. Drinking water regulations and health advisories. Washington, DC: U.S. Environmental Protection Agency. EPA822R96001.

9. REFERENCES

EPA. 1997. Special report on environmental endocrine disruption: An effects assessment and analysis. Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. EPA630R96012.

EPA. 2000a. Benchmark dose technical guidance document. Washington, DC: U.S. Environmental Protection Agency, Risk Assessment Forum. EPA630R00001.

EPA. 2000b. National air pollutant emission trends, 1900-1998. Research Triangle Park, NC: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. EPA454R00002. http://www.epa.gov/ttn/chief/trends/trends98/trends98.pdf. May 08, 2012.

EPA. 2005. Toxic chemical release inventory reporting forms and instructions: Revised 2004 version. Section 313 of the Emergency Planning and Community Right-to-Know Act (Title III of the Superfund Amendments and Reauthorization Act of 1986). U.S. Environmental Protection Agency, Office of Environmental Information. EPA260B05001.

EPA. 2008a. Drinking water health advisory for 2,4-dinitrotoluene and 2,6-dinitrotoluene. Washington, DC: U.S. Environmental Protection Agency. EPA822R08010. http://nepis.epa.gov/Exe/ZyPURL.cgi?Do ckey=P100165L.txt. May 02, 2012.

EPA. 2008b. The analysis of occurrence data from the first unregulated contaminant monitoring regulation (UCMR 1) in support of regulatory determinations for the second drinking water contaminant candidate list (CCL 2). U.S. Environmental Protection Agency. EPA815R08013. http://www.epa.gov/ogwdw/ccl/pdfs/reg_determine2/report_ccl2-reg2_ucmr1_occurrencereport.pdf. May 02, 2012.

EPA. 2009. National primary drinking water regulations. Washington, DC: U.S. Environmental Protection Agency, Office of Ground Water and Drinking Water. EPA816F090004. http://water.epa.gov/drink/contaminants/upload/mcl-2.pdf. March 4, 2015.

EPA. 2011. Dinitrotoluenes. EPI Suite results for CAS 602-01-7, 619-15-8, 606-20-2, 618-85-9, 610-39-9. Download EPI SuiteTM v4.10. U.S. Environmental Protection Agency. http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm. May 08, 2012.

EPA. 2012a. CAS 121-14-2. Non-confidential 2006 IUR records by chemical, including manufacturing, processing and use information. U.S. Environmental Protection Agency. http://cfpub.epa.gov/iursearch/index.cfm?err=t#chemical. May 03, 2012.

EPA. 2012b. 2012 Edition of the drinking water standards and health advisories. Washington, DC: U.S. Environmental Protection Agency, Office of Water. EPA822S12001. http://water.epa.gov/action/advisories/drinking/upload/dwstandards2012.pdf. March 4, 2015.

EPA. 2012c. National ambient air quality standards (NAAQS). Washington, DC: U.S. Environmental Protection Agency, Office of Air and Radiation. http://www.epa.gov/air/criteria.html. January 08, 2014.

EPA. 2013a. Title 42 - The public health and welfare. Chapter 85 - Air pollution prevention and control. Subchapter I - programs and activities. Part A - Air quality and emission limitations. Hazardous air pollutants. United States Code 42 USC 7412. http://www.gpo.gov/fdsys/pkg/USCODE-2013-title42/pdf/USCODE-2013-title42-chap85-subchapI-partA-sec7412.pdf. April 9, 2015.

EPA. 2013b. Designation of hazardous substances. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 116.4. http://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol22/pdf/CFR-2014-title40-vol22-sec116-4.pdf. March 4, 2015.

EPA. 2013c. National recommended water quality criteria. Washington, DC: U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology. http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm. March 4, 2015.

EPA. 2013d. Determination of reportable quantities for hazardous substances. Subpart A - General provisions. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 117.3. http://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol22/pdf/CFR-2014-title40-vol22-sec117-3.pdf. March 4, 2015.

EPA. 2013e. Appendix VIII to Part 261-Hazardous constituents. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 261, Appendix VIII. http://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol27/pdf/CFR-2013-title40-vol27-part261-appVIII.pdf. September 10, 2014.

EPA. 2013f. Appendix A to Part 355—The list of extremely hazardous substances and their threshold planning quantities. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 355. http://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol29/pdf/CFR-2013-title40-vol29-part355-appA.pdf. September 10, 2014.

EPA. 2014a. Final AEGLs (162). Washington, DC: U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. http://www.epa.gov/oppt/aegl/pubs/compiled_aegls_update_03oct2014.pdf. March 4, 2015.

EPA. 2014b. Draft: Updated national recommended water quality criteria - human health. Washington, DC: U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology. http://water.epa.gov/scitech/swguidance/standards/criteria/current/hhdraft.cfm. April 9, 2015.

EPA. 2014c. InertFinder. U.S. Environmental Protection Agency. http://iaspub.epa.gov/apex/pesticides/f?p=101:1:. March 31, 2015.

EPA. 2014d. Designation of hazardous substances. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 302.4. http://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol28/pdf/CFR-2014-title40-vol28-sec302-4.pdf. March 4, 2015.

EPA. 2014e. Chemicals and chemical categories to which this part applies. Subpart D - Specific toxic chemical listings. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 372.65. http://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol28/pdf/CFR-2014-title40-vol28-sec372-65.pdf. March 4, 2015.

EPA. 2014f. Chemical lists and reporting periods. Subpart B - Manufacturers reporting - preliminary assessment information. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 712.30. http://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol31/pdf/CFR-2014-title40-vol31-sec712-30.pdf. April 9, 2015.

EPA. 2014g. Substances and listed mixtures to which this subpart applies. Subpart B - Specific chemical listings. U.S. Environmental Protection Agency. Code of Federal Regulations 40 CFR 716.120. http://www.gpo.gov/fdsys/pkg/CFR-2014-title40-vol31/pdf/CFR-2014-title40-vol31-sec716-120.pdf. April 9, 2015.

FDA. 2013. Everything added to food in the United States (EAFUS). Washington, DC: U.S. Food and Drug Administration. http://www.accessdata.fda.gov/scripts/fcn/fcnnavigation.cfm?rpt=eafuslisting. April 9, 2015.

Feltes J, Levsen K, Volmer D, et al. 1990. Gas chromatographic and mass spectrometric determination of nitroaromatics in water. J Chromatogr 518:21-40.

Fomon SJ. 1966. Body composition of the infant: Part I: The male reference infant. In: Falkner F, ed. Human development. Philadelphia, PA: WB Saunders, 239-246.

Fomon SJ, Haschke F, Ziegler EE, et al. 1982. Body composition of reference children from birth to age 10 years. Am J Clin Nutr 35(Suppl 5):1169-1175.

Ford LS. 1981. Eye irritation test of 1-methyl-2,4-dinitrotoluene in rabbits with cover letter outlining current study of tetrahydrofuran dated 05/10/94. Submitted to the U.S. Environmental Protection Agency under TSCA Section 8D. OTS0557136.

Freedman DL, Shanley RS, Scholze RJ. 1996. Aerobic biodegradation of 2,4-dinitrotoluene, aminonitrotoluene isomers, and 2,4-diaminotoluene. J Haz Mater 49:1-14.

George SE, Allison JC, Brooks LR, et al. 1998. Modulation of 2,6-dinitrotoluene genotoxicity by alachlor treatment of Fischer 344 rats. Environ Mol Mutagen 31(3):274-281.

George SE, Chadwick RW, Chang JJ, et al. 1992. 2,4,5-Trichlorophenoxyacetic acid influence on 2,6-dinitrotoluene-induced urine genotoxicity in Fischer 344 rats: Effect on gastrointestinal microflora and enzyme activity. Fundam Appl Toxicol 18:240-246.

George SE, Kohan MJ, Warren SH. 1996. Hepatic DNA adducts and production of mutagenic urine in 2,6-dinitrotoluene-treated B6C3F_1 male mice. Cancer Lett 102:107-111.

Gillett JW. 1983. A comprehensive pre-biologic screen for ecotoxicologic effects. Environ Toxicol Chem 2:463-476.

Giwercman A, Carlsen E, Keiding N, et al. 1993. Evidence for increasing incidence of abnormalities of the human testis: A review. Environ Health Perspect Suppl 101(2):65-71.

Goldsworthy TL, Hamm Jr. TE, Rickert DE et al. 1986. The effect of diet on 2,6-dinitrotoluene hepatocarcinogenesis. Carcinogenesis 7:1909-1915.

Grant CL, Jenkins TF, Myers KF, et al. 1995. Holding-time estimates for soils containing explosive residues: Comparison of fortification vs. field contamination. Environ Toxicol Chem 14:1865-1874.

Great Lakes Commission. 2006. 2002 Inventory of toxic air emissions for the Great Lakes Region. http://glc.org/air/inventory/2002/2002report_Full.pdf. May 03, 2012.

Griest WH, Stewart AJ, Tyndall RL, et al. 1993. Chemical and toxicological testing of composted explosives-contaminated soil. Environ Toxicol Chem 12:1105-1116.

Gruener N. 1976. Ontogenetic development of NADH-dependent methemoglobin reductase in erythrocytes of man and rat. J Toxicol Environ Health 1:787-791.

Guest D, Schnell SR, Rickert DE, et al. 1982. Metabolism of 2,4-dinitrotoluene by intestinal microorganisms from rat, mouse and man. Toxicol Appl Pharmacol 64:160-168.

Gurka DF, Titus R, Griffiths PR, et al. 1987. Evaluation of an improved single-beam gas chromatography/Fourier transform infrared interface for environmental analysis. Anal Chem 59:2362-2369.

Guzelian PS, Henry CJ, Olin SS, eds. 1992. Similarities and differences between children and adults: Implications for risk assessment. Washington, DC: International Life Sciences Institute Press.

Hable M, Stern C, Asowata C, et al. 1991. The determination of nitroaromatics and nitroamines in ground and drinking water by wide-bore capillary gas chromatography. J Chromatogr Sci 29:131-135.

Haderlein SB, Weissmahr KW, Schwarzenbach RP. 1996. Specific adsorption of nitroaromatic explosives and pesticides to clay minerals. Environ Sci Technol 30(2):612-622.

Hallas LE, Alexander M. 1983. Microbial transformation of nitro aromatic compounds in sewage effluent. Appl Environ Microbiol 45:1234-1241.

Hamill PVV, Steinberger E, Levine RJ, et al. 1982. The epidemiologic assessment of male reproductive hazard from occupational exposure to TDA and dinitrotoluene. J Occup Med 24:985-993.

Harth V, Bolt HM, Bruning T. 2005. Cancer of the urinary bladder in highly exposed workers in the production of dinitrotoluenes: A case report. Int Arch Occup Environ Health 78(8):677-680.

Hashimoto A, Sakino H, Kojima T, et al. 1982. Sources and behavior of dinitrotoluene isomers in sea water. Water Res 16:891-898.

Hashimoto Y, Tokura K, Kishi H, et al. 1984. Prediction of sea-water solubility of aromatic compounds. Chemosphere 13:881-888.

HazDat. 2007. 2,4- and 2,6-DNT. HazDat Database: ATSDR's Hazardous Substance Release and Health Effects Database. Atlanta, GA: Agency for Toxic Substances and Disease Registry. http://www.atsdr.cdc.gov/hazdat.html.

Hazleton Laboratories. 1977. A thirty-day toxicology study in Fischer-344 rats given dinitrotoluene, technical grade. Full report. Submitted to Chemical Industry Institute of Toxicology, Research Triangle Park, NC. Submitted to the U.S. Environmental Protection Agency under TSCA Section 8D. Document No. 878212040. OTS0205947.

Hazleton Laboratories. 1982. 104-week chronic study in rats. Dinitrotoluene. Final report Volume I of II. Submitted to Chemical Industry Institute of Toxicology, Research Triangle Park, NC. Submitted to the U.S. Environmental Protection Agency under TSCA Section 8D. Document No. 878212041. OTS0205947.

Ho PC. 1986. Photooxidation of 2,4-dinitrotoluene in aqueous solution in the presence of hydrogen peroxide. Environ Sci Technol 20:260-267.

Hodgson JR, Kowalski MA, Glennon JP, et al. 1976. Mutagenicity studies on 2,4-dinitrotoluene [Abstract]. Mutat Res 38:387.

Hoel DG, Davis DL, Miller AB, et al. 1992. Trends in cancer mortality in 15 industrialized countries, 1969-1986. J Natl Cancer Inst 84(5):313-320.

Hoke RA, Giesy JP, Zabik M, et al. 1993. Toxicity of sediments and sediment pore waters from the Grand Calumet River-Indiana Harbor are of concern. Ecotoxicol Environ Saf 26:86-112.

Holen I, Mikalsen SO, Sanner T. 1990. Effects of dinitrotoluenes on morphological cell transformation and intercellular communication in Syrian hamster embryo cells. J Toxicol Environ Health 29:89-98.

Honeychurch KC, Hart JP, Pritchard PR, et al. 2003. Development of an electrochemical assay for 2,6-dinitrotoluene, based on a screen-printed carbon electrode, and its potential application in bioanalysis, occupational and public health. Biosens Bioelectron 19(4):305-312.

Hong CB, Ellis JV, Lee CC, et al. 1985. Subchronic and chronic toxicity studies of 2,4-dinitrotoluene. Part III. CD-l mice. J Am Coll Toxicol 4:257-269.

HSDB. 2012. Dinitrotoluenes. Hazardous Substances Data Bank. National Library of Medicine. http://toxnet.nlm.nih.gov. May 08, 2012.

Huang J, Ning G, Li F, et al. 2015. Biotransformation of 2,4-dinitrotoluene by obligate marine *Shewanella marisflavi* EP1 under anaerobic conditions. Bioresour Technol 180:200-206. 10.1016/j.biortech.2014.12.108.

Huang Q, Wang L, Han S. 1995. The genotoxicity of substituted nitrobenzenes and the quantitative structure-activity relationship studies. Chemosphere 30:915-923.

Huang QG, Kong LR, Liu YB et al. 1996. Relationships between molecular structure and chromosomal aberrations in *in vitro* human lymphocytes induced by substituted nitrobenzenes. Bull Environ Contam Toxicol 57:349-353.

Hughes JB, Wang C, Zhang C. 1999. Anaerobic biotransformation of 2,4-dinitrotoluene and 2,6-dinitrotoluene by *Clostridium acetobutylicum*: A pathway through dihydroxylamino intermediates. Environ Sci Technol 33(7):1065-1070.

Hunt RJ, Neubauer NR, Picone RF. 1980. An improved procedure for sampling and analysis of dinitrotoluene vapor concentrations in workplace air. Am Ind Hyg Assoc J 41:592-594.

IARC. 1996. 2,4- Dinitrotoluene and 2,6-dinitrotoluene. IARC monographs on the evaluation of carcinogenic risks to humans. Vol. 65: Lyon, France: World Health Organization, International Agency for Research on Cancer.

IARC. 2015. Agents classified by the IARC monographs. Volumes 1–112. Lyon, France: International Agency for Research on Cancer. http://monographs.iarc.fr/ENG/Classification/ClassificationsCASOrder.pdf. March 31, 2015.

IRIS. 2002. 2,4-Dinitrotoluene (CASRN 121-14-2). Integrated Risk Information System. Washington, DC: U.S. Environmental Protection Agency. http://www.epa.gov/iris/subst/0524.htm. April 9, 2015.

IRIS. 2003. 2,4-/2,6-Dinitrotoluene mixture; no CASRN. Integrated Risk Information System. Washington, DC: U.S. Environmental Protection Agency. http://www.epa.gov/iris/subst/0397.htm. April 9, 2015.

Jenkins TF, Walsh ME. 1992. Development of field screening methods for TNT, 2,4-DNT and RDX in soil. Talanta 39:419-428.

Jenkins TF, Hewitt AD, Grant CL, et al. 2006. Identity and distribution of residues of energetic compounds at army live-fire training ranges. Chemosphere 63:1280-1290.

Jenkins TF, Leggett DC, Grant CL, et al. 1986. Reversed-phase high-performance liquid chromatographic determination of nitroorganics in munitions wastewater. Anal Chem 58:170-175.

Jokinen MP, Clarkson TB, Prichard RW. 1985. Animal models in atherosclerosis research. Exp Mol Pathol 42:1-28.

Jones CR, Liu YY, Sepai O, et al. 2005a. Hemoglobin adducts in workers exposed to nitrotoluenes. Carcinogenesis (Oxford) 26(1):133-143.

Jones CR, Sepai O, Liu YY, et al. 2005b. Urinary metabolites of workers exposed to nitrotoluenes. Biomarkers 10(1):10-28.

Jones-Price C, Marks TA, Ledoux TA, et al. 1982. Teratological and postnatal evaluation of dinitrotoluene in Fischer-344 rats. Final report. E.I. Dupont de Nemours & Co. Submitted to the U.S. Environmental Protection Agency under TSCA Section 8D. EPA86940000730S. OTS0557140.

Kawai A, Goto S, Matsumoto Y, et al. 1987. Mutagenicity of aliphatic and aromatic nitro compounds, industrial materials, and related compounds. Jpn J Ind Health 29(1):34-54.

Kearns GL, Abdel-Rahman SM, Alander SW, et al. 2003. Developmental pharmacology--drug disposition, action, and therapy in infants and children. N Engl J Med 349(12):1157-1167.

Kedderis GL, Dyroff MC, Rickert DE. 1984. Hepatic macromolecular binding of the hepatocarcinogen 2,6-DNT and its 2,4-isomer *in vivo*; modulation by the sulfotransferase inhibitors pentachlorophenol and 2,6-dichloro-4-nitrophenol. Carcinogenesis 5:1199-1204.

Kessel S, Hauck HE. 1996. Qualitative and quantitative determination of 2,4,6-TNT, hexogen, octogen, aminonitro- and nitrocompounds in ammunition wastes with modified TLC and HPTLC precoated layers. Chromatographia 43:401-404.

Kholod YA, Gryn'ova G, Gorb L, et al. 2011. Evaluation of the dependence of aqueous solubility of nitro compounds on temperature and salinity: A COSMO-RS simulation. Chemosphere 83:287-294.

Komori M, Nishio K, Kitada M, et al. 1990. Fetus-specific expression of a form of cytochrome P-450 in human livers. Biochemistry 29(18):4430-4433.

Kozuka H, Mori M, Katayama K, et al. 1978. Studies on the metabolism and toxicity of dinitrotoluenes-metabolism of dinitrotoluenes by *Rhodotorula glutinis* and rat liver homogenate. Jpn J Toxicol Environ Health (Eisei Kagaku) 24(5):252-259.

Kozuka H, Mori M, Nause Y. 1979. Studies on the metabolism and toxicity of dinitrotoluenes. Toxicological study of 2,4-dinitrotoluene (2,4-DNT) in rats in long-term feeding. J Toxicol Sci 4:221-228.

Krishnan K, Andersen ME. 1994. Physiologically based pharmacokinetic modeling in toxicology. In: Hayes AW, ed. Principles and methods of toxicology. 3rd ed. New York, NY: Raven Press, Ltd., 149-188.

Krishnan K, Andersen ME, Clewell HJ, et al. 1994. Physiologically based pharmacokinetic modeling of chemical mixtures. In: Yang RSH, ed. Toxicology of chemical mixtures: Case studies, mechanisms, and novel approaches. San Diego, CA: Academic Press, 399-437.

Kumar S, Davis AP. 1997. Heterogeneous photocatalytic oxidation of nitrotoluenes. Water Environ Res 69:1238-1245.

La DK, Froines JR. 1992. Comparison of DNA adduct formation between 2,4- and 2,6-dinitrotoluene by ^{32}P-postlabelling analysis. Arch Toxicol 66:633-640.

La DK, Froines JR. 1993. Comparison of DNA binding between the carcinogen 2,6-dinitrotoluene and its noncarcinogenic analog 2,6-diaminotoluene. Mutat Res 301:79-85.

Lane RW, Simon GS, Dougherty RW, et al. 1985. Reproductive toxicity and lack of dominant lethal effects of 2,4-dinitrotoluene in the male rat. Drug Chem Toxicol 8:265-280.

Lang PZ, Wang Y, Chen DB, et al. 1997. Bioconcentration, elimination and metabolism of 2,4-dinitrotoluene in carps (*Cyprinus Carpio L.*). Chemosphere 35(8):1799-1815.

Lee CC, Hong CB, Ellis HV, et al. 1985. Subchronic and chronic toxicity studies of 2,4-dinitrotoluene. Part II. CD rats. J Am Coll Toxicol 4:243-256.

Lee YS, Hunter JV. 1985. Effect of ozonation and chlorination of Environmental Protection Agency priority pollutant. In: Jolley RL, Bull RJ, Davis WP, et al., eds. Water chlorination: Chemistry, environmental impact and health effects. Vol. 5. Chelsea, MI: Lewis Publishers, Inc. 1515-1526.

Leeder JS, Kearns GL. 1997. Pharmacogenetics in pediatrics: Implications for practice. Pediatr Clin North Am 44(1):55-77.

Leikin JB, Paloucek FP. 2008. Poisoning and toxicology handbook. 4th ed. Boca Raton, FL: CRC Press, 830.

Lenke H, Warrelmann J, Daun G, et al. 1998. Biological treatment of TNT-contaminated soil. 2. Biologically induced immobilization of the contaminants and full-scale application. Environ Sci Technol 32:1964-1971.

Lent EM, Crouse LC, Quinn MJ, Jr., et al. 2012a. Comparison of the repeated dose toxicity of isomers of dinitrotoluene. Int J Toxicol 31(2):143-157.

Lent EM, Crouse LC, Quinn MJ, Jr., et al. 2012b. Assessment of the *in vivo* genotoxicity of isomers of dinitrotoluene using the alkaline Comet and peripheral blood micronucleus assays. Mutat Res 742(1-2):54-60.

9. REFERENCES

Leonard TB, Adams T, Popp JA. 1986. Dinitrotoluene isomer-specific enhancement of the expression of diethylnitrosamine-initiated hepatocyte foci. Carcinogenesis 7:1797-1803.

Leonard TB, Graichen ME, Popp JA. 1987. Dinitrotoluene isomer-specific hepatocarcinogenesis in F344 rats. JNCI 79:1313-1319.

Leonard TB, Lyght O, Popp JA. 1983. Dinitrotoluene structure-dependent initiation of hepatocytes *in vivo*. Carcinogenesis 4:1059-1061.

Letzel S, Goen T, Bader M, et al. 2003. Exposure to nitroaromatic explosives and health effects during disposal of military waste. Occup Environ Med 60(7):483-488.

Leung HW. 1993. Physiologically-based pharmacokinetic modelling. In: Ballentyne B, Marrs T, Turner P, eds. General and applied toxicology. Vol. 1. New York, NY: Stockton Press, 153-164.

Levine RJ, Andjelkovich DA, Kersteter SL, et al. 1986a. Heart disease in workers exposed to dinitrotoluene. J Occup Med 28:811-816.

Levine RJ, Andjelkovich DA, Kersteter SL, et al. 1986b. Mortality of munitions workers exposed to dinitrotoluene. Final Report. Research Triangle Park, NC: Chemical Industry Institute of Toxicology. Government Accession No. ADA 167600.

Levine RJ, Corso RDD, Blunden PB. 1985a. Fertility of workers exposed to dinitrotoluene and TDA at three chemical plants. In: Rickert DE, ed. Toxicity of nitroaromatic compounds. Chemical Industry Institute of Toxicology Series. Washington, DC: Hemisphere Publishing Corp., 243-254.

Levine RJ, Turner MJ, Crume YS, et al. 1985b. Assessing exposure to dinitrotoluene using a biological monitor. J Occup Med 279:627-638.

Liu D, Thomson K, Anderson AC. 1984. Identification of nitroso compounds from biotransformation of 2,4-dinitrotoluene. Appl Environ Microbiol 47:1295-1298.

Livingston AL. 1978. Forage plant estrogens. J Toxicol Environ Health 4(2-3):301-324.

Lloyd JBF. 1983a. Clean-up procedures for the examination of swabs for explosive traces by high-performance liquid chromatography with electrochemical detection at a pendent drop electrode. J Chromatogr 261:391-406.

Lloyd JBF. 1983b. High-performance liquid chromatography of organic explosives components with electrochemical detection at a pendant mercury drop electrode. J Chromatogr 257:227-236.

Long LM, Rickert DE. 1982. Metabolism and excretion of 2,6-dinitro-[14^{C}]toluene *in vivo* and in isolated perfused rat livers. Drug Metab Dispos 10:455-458.

Lopes TJ, Furlong ET. 2001. Occurrence and potential adverse effects of semivolatile organic compounds in streambed sediment, United States, 1992-1995. Environ Toxicol Chem 20(4):727-737.

Loveday KS, Lugo MH, Resnick MA, et al. 1989. Chromosome aberration and sister chromatid exchange tests in Chinese hamster ovary cells *in vitro*: II. Results with 20 chemicals. Environ Mol Mutagen 13:60-94.

Luning Prak DJ, O'Sullivan DW. 2007. Solubility of 4-nitrotoluene, 2,6-dinitrotoluene, 2,3-dinitrotoluene, and 1,3,5-trinitrobenzene in pure water and seawater. J Chem Eng Data 52:2446-2450.

Maeda T, Nakamura R, Kadokami K, et al. 2007. Relationship between mutagenicity and reactivity or biodegradability for nitroaromatic compounds. Environ Toxicol Chem 26(2):237-241.

Maksimov YY. 1968. Vapor pressures of aromatic nitrocompounds at various temperatures. Russian J Phys Chem 42:1550-1552.

Mayr U, Butsch A, Schneider S. 1992. Validation of two *in vitro* test systems for estrogenic activities with zearalenone, phytoestrogens and cereal extracts. Toxicology 74(2-3):135-149.

McFarlane C, Nolt C, Wickliff C, et al. 1987. The uptake, distribution and metabolism of four organic chemicals by soybean plants and barley roots. Environ Toxicol Chem 6:847-856.

McGee LC, McCausland A, Plume CA, et al. 1942. Metabolic disturbances in workers exposed to dinitrotoluene. Am J Digest Dis 9:329-331.

McGee LC, Reed HL, Nereim TJ, et al. 1947. Metabolic disturbances in workers exposed to dinitrotoluene during World War II. Gastroenterology 8:293-295.

McGown EL, Knudsen JJ, Makovec GT, et al. 1983. Fourteen-day feeding study of 2,4-dinitrotoluene in male and female rats. U.S. Army Medical Research and Development Command, Division of Research Support, Letterman Army Institute of Research. ADA126069.

Medinsky MA, Dent JG. 1983. Biliary excretion and enterohepatic circulation of 2,4-dinitrotoluene metabolites in Fischer-344 Rats. Toxicol Appl Pharmacol 68:359-366.

Michael LC, Pellizari ED, Wiseman RW. 1988. Development and evaluation of a procedure for determining volatile organics in water. Environ Sci Technol 22:565-570.

Mirsalis JC, Butterworth BE. 1982. Induction of unscheduled DNA synthesis in rat hepatocytes following *in vivo* treatment with dinitrotoluene. Carcinogenesis 3:241-245.

Mirsalis JC, Tyson CK, Steinmetz KL, et al. 1989. Measurement of unscheduled DNA synthesis and S-phase synthesis in rodent hepatocytes following *in vivo* treatment: Testing of 24 compounds. Environ Mol Mutagen 14:155-164.

Monti MR, Smania AM, Fabro G, et al. 2005. Engineering *pseudomonas fluorescens* for biodegradation of 2,4-dinitrotoluene. Appl Environ Microbiol 71(12):8864-8872.

Mori M, Kudo Y, Nunozawa T, et al. 1985. Intestinal metabolism of 2,4-dinitrotoluene in rats. Chem Pharm Bull 33:327-332.

Mori MA, Miyahara T, Hasegawa Y, et al. 1984. Metabolism of dinitrotoluene isomers by *Escherichia coli* isolated from human intestine. Chem Pharm Bull (Tokyo) 32(10):4070-4075.

Mori M, Miyahara T, Taniguchi K, et al. 1982. Mutagenicity of 2,4-dinitrotoluene and its metabolites in *Salmonella typhimurium*. Toxicol Lett 13:1-5.

Mori MA, Sayama M, Shoji M et al. 1997. Biliary excretion and microfloral transformation of major conjugated metabolites of 2,4-dinitrotoluene and 2,6-dinitrotoluene in the male Wistar rat. Xenobiotica 27:1225-1236.

Mori MA, Shoji M, Dohrin M, et al. 1996. Further studies on the urinary metabolites of 2,4-dinitrotoluene and 2,6-dinitrotoluene in the male Wistar rat. Xenobiotica 26:79-88.

Mori M, Shoji M, Sayama M, et al. 2000. Secondary metabolism of dinitrobenzyl glucuronide related to production of genotoxic compounds of dinitrotoluene in male Wistar rat. J Health Sci 46(5):329-335.

Morselli PL, Franco-Morselli R, Bossi L. 1980. Clinical pharmacokinetics in newborns and infants: Age-related differences and therapeutic implications. Clin Pharmacokin 5(6):485-527.

Nacson S, Legrady O, Siu T, et al. 1994. Improved and novel approaches for the detection of explosives. Proc SPIE Int Soc Opt Eng 2276:69-78.

NAS/NRC. 1989. Report of the oversight committee. In: Biologic markers in reproductive toxicology. Washington, DC: National Academy of Sciences, National Research Council, National Academy Press, 15-35.

NCI. 1978. Bioassay of 2,4-dinitrotoluene for possible carcinogenicity. CAS No. 121-14-2. Washington, DC: National Cancer Institute, U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health. NCI-CG-TR-54.

Neuwoehner J, Schofer A, Erlenkaemper B, et al. 2007. Toxicological characterization of 2,4,6-trinitrotoluene, its transformation products, and two nitramine explosives. Environ Toxicol Chem 26(6):1090-1099.

NIOSH. 1980. Health hazard evaluation determination. Report no. HE 79-113-728. Olin Chemical Co., Brandenberg, KY. Hazard Evaluations and Technical Assistance Branch. National Institute of Occupational Safety and Health. OTS0204878, Section 8E.

NIOSH. 1982. Health Hazard Evaluation Report, No. HETA-81-295-1155, Olin (formerly Allied) Chemical Co., Moundsville, WV. Cincinnati, OH: National Institute of Occupational Safety and Health, Hazard Evaluations and Technical Assistance Branch. OTS0528962, Section 4. PB84150465.

NIOSH. 1997. NIOSH pocket guide to chemical hazards. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health. NIOSH publication No. 94-116.

NIOSH. 2015. Dinitrotoluene. NIOSH pocket guide to chemical hazards. Atlanta, GA: National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention. http://www.cdc.gov/niosh/npg/npgd0235.html. April 1, 2015.

Nipper M, Carr RS, Biedenbach JM, et al. 2005. Fate and effects of picric acid and 2,6-DNT in marine environments: Toxicity of degradation products. Mar Pollut Bull 50(11):1205-1217.

Nipper M, Qian Y, Carr RS, et al. 2004. Degradation of picric acid and 2,6-DNT in marine sediments and waters: The role of microbial activity and ultra-violet exposure. Chemosphere 56(6):519-530.

Nishino SF, Spain JC, Lenke H, et al. 1999. Mineralization of 2,4- and 2,6-dinitrotoluene in soil slurries. Environ Sci Technol 33(7):1060-1064.

NITE. 2002. Dinitrotoluene. National Institute of Technology and Evaluation. http://www.safe.nite.go.jp/data/hazkizon/pk_e_kizon_data_result.home_data. May 02, 2012.

Noguera DR, Freedman DL. 1996. Reduction and acetylation of 2,4-dinitrotoluene by a *Pseudomonas aeruginosa* strain. Applied Environ Microbiol 62:2257-2263.

Noguera DR, Freedman DL. 1997. Characterization of products from the biotransformation of 2,4-dinitrotoluene by denitrifying enrichment cultures. Water Environ Res 69:260-268.

NRC. 1993. Pesticides in the diets of infants and children. National Research Council, Washington DC: National Academy Press.

NTP. 2014. Report on Carcinogens. Thirteenth edition. Research Triangle Park, NC: U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program. http://ntp.niehs.nih.gov/pubhealth/roc/roc13/. April 9, 2015.

Oehrle SA. 1996. Analysis of nitramine and nitroaromatic explosives by capillary electrophoresis. J Chromatogr A 745:233-237.

Ortega-Calvo JJ, Fesch C, Harms H. 1999. Biodegradation of sorbed 2,4-dinitrotoluene in a clay-rich, aggregated porous medium. Environ Sci Technol 33(21):3737-3742.

OSHA. 2010. 2,4-Dinitrotoluene (DNT), 2,4,6-trinitrotoluene (TNT). Method No. 44. Sampling and analytical methods. Occupational Safety and Health Administration. http://www.osha.gov/dts/sltc/methods/organic/org044/org044.html. May 03, 3012.

OSHA. 2013. Subpart Z - Toxic and hazardous substances. Air contaminants. Occupational Safety and Health Standards. Code of Federal Regulations 29 CFR 1910.1000. http://www.gpo.gov/fdsys/pkg/CFR-2014-title29-vol6/pdf/CFR-2014-title29-vol6-sec1910-1000.pdf. March 4, 2015.

OSHA. 2014a. Gases, vapors, fumes, dusts, and mists. Appendix A to 1926.55-1970. American Conference Of Governmental Industrial Hygienists' threshold limit values of airborne contaminants for construction. Subpart D-Occupational health and environmental controls. Occupational Safety and Health Standards. Code of Federal Regulations 29 CFR 1926.55. http://www.gpo.gov/fdsys/pkg/CFR-2014-title29-vol8/pdf/CFR-2014-title29-vol8-sec1926-55.pdf. March 4, 2015.

OSHA. 2014b. Subpart Z - Toxic and hazardous substances. Air contaminants. Table Z - Shipyards. Occupational Safety and Health Standards. Code of Federal Regulations 29 CFR 1915.1000. http://www.gpo.gov/fdsys/pkg/CFR-2013-title29-vol7/pdf/CFR-2013-title29-vol7-sec1915-1000.pdf. March 4, 2015.

Owen GM, Brozek J. 1966. Influence of age, sex and nutrition on body composition during childhood and adolescence. In: Falkner F, ed. Human development. Philadelphia, PA: WB Saunders, 222-238.

Ozturk K, Durusoy M. 1999. The detection and comparison of the genotoxic effects of some nitro aromatic compounds by the umu and SOS chromotest systems. Toxicol Lett 108(1):63-68.

9. REFERENCES

Padda RS, Wang C, Hughes JB, et al. 2003. Mutagenicity of nitroaromatic degradation compounds. Environ Toxicol Chem 22(10):2293-2297.

Parrish FW. 1977. Fungal transformation of 2,4-dinitrotoluene and 2,4,6-trinitrotoluene. Appl Environ Microbiol 34:232-233.

Pearson JG, Glennon JP, Barkley JJ, et al. 1979. An approach to the toxicological evaluation of a complex industrial wastewater. Annual Symposium on Aquatic Toxicology 2:284-301.

Pennington JC. 1988. Plant uptake of 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, and 2-amino-4,6-dinitrotoluene using ^{14}C-labeled and unlabeled compounds. Army Engineer Waterways Experiment Station, Vicksburg, MS. Report No. WES/TR/EL-88-20. ADA203690.

Perkins RG. 1919. A study of the munitions intoxications in France. US Pub Health Rep 34:2335-2374.

Phillips JH, Coraor RJ, Prescott SR. 1983. Determination of nitroaromatics in biosludges with a gas chromatograph/thermal energy analyzer. Anal Chem 55:889-892.

Podlipna R, Pospisilova B, Vanek T. 2015. Biodegradation of 2,4-dinitrotoluene by different plant species. Ecotoxicol Environ Saf 112:54-59.

Popp JA, Leonard TB. 1982. The use of *in vivo* hepatic initiation-promotion systems in understanding the hepatocarcinogenesis of technical grade dinitrotoluene. Toxicol Pathol 10(2):190-196.

Preslan JE, Hatrel BB, Emerson M, et al. 1993. An improved method for analysis of 2,4,6-trinitrotoluene and its metabolites from compost and contaminated soils. J Hazard Mater 33:329-337.

*Ramos K, McMahon K, Alipui C, et al. 1991a. Modulation of aortic smooth muscle cell proliferation by dinitrotoluene. Adv Exp Med Biol 283(Biological Reactive Intermediates 4):805-808.

*Ramos KS, McMahon KK, Alipui C, et al. 1991b. Modulation of DNA synthesis in aortic smooth muscle cells by dinitrotoluenes. Cell Biol Toxicol 7:111-128.

Reader SC, Foster P. 1990. The *in vitro* effects of four isomers of dinitrotoluene on rat Sertoli and Sertoli-germ cell cocultures: Germ cell detachment and lactate and pyruvate production. Toxicol Appl Pharmacol 106:287-294.

Reifenrath WG, Kammen HO, Palmer WG, et al. 2002. Percutaneous absorption of explosives and related compounds: An empirical model of bioavailability of organic nitro compounds from soil. Toxicol Appl Pharmacol 182(2):160-168.

Rickert DE, Long RM. 1980. Tissue distribution of 2,4-dinitrotoluene and its metabolites in male and female Fischer-344 rats. Toxicol Appl Pharmacol 56:286-293.

Rickert DE, Long RM. 1981. Metabolism and excretion of 2,4-dinitrotoluene in male and female Fischer-344 rats after different doses. Drug Metab Dispos 9:226-232.

Rickert DE, Butterworth BE, Popp JA. 1984. Dinitrotoluene: Acute toxicity, oncogenicity, genotoxicity, and metabolism. CRC Crit Rev Toxicol 13:217-234.

9. REFERENCES

Rickert DE, Long RM, Krakowka S, et al. 1981. Metabolism and excretion of 2,4-(^{14}C)dinitrotoluene in conventional and axenic Fischer-344 rats. Toxicol Appl Pharmacol 59:574-579.

Rickert DE, Schnell SR, Long RM. 1983. Hepatic macromolecular covalent binding and intestinal disposition of 2,4-(^{14}C)dinitrotoluene. J Toxicol Environ Health 11: 555-568.

Roberts MG, Rugh CL, Li H, et al. 2007. Reducing bioavailability and phytotoxicity of 2,4-dinitrotoluene by sorption on K-smectite clay. Environ Toxicol Chem 26(2):358-360.

Rothfuss A, O'Donovan M, De Boeck M, et al. 2010. Collaborative study on fifteen compounds in the rat-liver Comet assay integrated into 2- and 4-week repeat-dose studies. Mutat Res 702(1):40-69.

Sabbioni G, Jones CR, Sepai O, et al. 2006. Biomarkers of exposure, effect, and susceptibility in workers exposed to nitrotoluenes. Cancer Epidemiol Biomarkers Prev 15(3):559-566.

Saunders NR, Ek CJ, Habgood M, et al. 2008. Barriers in the brain: A renaissance? Trends Neurosci 31(6):279-286.

Saunders NR, Liddelow SA, Dziegielewska KM. 2012. Barrier mechanisms in the developing brain. Front Pharmacol 3(46):1-18.

Sayama M, Mori MA, Maruyama Y, et al. 1993. Intestinal transformation of 2,6-dinitrotoluene in male Wistar rats. Xenobiotica 23:123-131.

Sayama M, Mori M, Shirokawa T, et al. 1989. Mutagenicity of 2,6-dinitrotoluene and its metabolites, and their related compounds in *Salmonella typhimurium*. Mutat Res 226:181-184.

Sayama M, Mori M, Shoji M, et al. 1998. Mutagenicities of 2,4- and 2,6-dinitrotoluenes and their reduced products in *Salmonella typhimurium* nitroreductase- and O-acetyltransferase-overproducing Ames test strains. Mutat Res 420(1-3):27-32.

Scheuplein R, Charnley G, Dourson M. 2002. Differential sensitivity of children and adults to chemical toxicity. I. Biological basis. Regul Toxicol Pharmacol 35(3):429-447.

Schut HAJ, Loeb TR, Grimes LA, et al. 1983. Distribution, elimination, and test for carcinogenicity of 2,6-dinitrotoluene after intraperitoneal and oral administration to strain A mice. J Toxicol Environ Health 12:659-670.

Seidler A, Bruning T, Taeger D, et al. 2014a. Cancer incidence among workers occupationally exposed to dinitrotoluene in the copper mining industry. Int Arch Occup Environ Health 87(2):117-124.

Seidler A, Harth V, Taeger D, et al. 2014b. Dinitrotoluene exposure in the copper mining industry and renal cancer: A case-cohort study. Occup Environ Med 71(4):259-265.

Seifert SA. 2004. Nitrates and nitrites. In: Dart RC, ed. Medical toxicology. 3rd ed. Philadelphia, PA: Lippincott Williams & Williams, 1174-1180.

Shackelford WM, Keith LH. 1976. Frequency of organic compounds identified in water. Athens, GA: U.S. Environmental Protection Agency, Environmental Research Laboratory. EPA600476062.

Short RD, Lee CC. 1980. Effect of some nitrotoluenes on the biotransformation of xenobiotics in rats. Experimentia (Basel) 36:100-101.

Simini M, Wentsel RS, Checkai RT, et al. 1995. Evaluation of soil toxicity at Joliet Army Munition Plant. Environ Toxicol Chem 14:623-630.

Simmon VF, Kauhanen K, Tardiff RG. 1977. Mutagenic activity of chemicals identified in drinking water. In: Scott S, Bridges BA, Sohels FH, eds. Progress in genetic toxicology, 249-258.

Simmons MS, Zepp RG. 1986. Influence of humic substances on photolysis of nitroaromatic compounds in aqueous systems. Water Res 20:899-904.

Smirnova IA, Dian C, Leonard GA, et al. 2004. Development of a bacterial biosensor for nitrotoluenes: The crystal structure of the transcriptional regulator DntR. J Mol Biol 340(3):405-418.

Smith EF II, Smith HJ, Kuchar EJ. 1995. Monitoring of dinitrotoluene and its metabolites in urine by spectrophotometry of their coupled aryldiazonium salts. Am Ind Hyg Assoc J 56:1175-1179.

Smith RP. 1996. Toxic responses of the blood. In: CD Klaassen, MJ Wonsiewicz, LA Sheinis, eds. Casarett and Doull's toxicology, the basic science of poisons, 5th ed. New York, NY: Macmillan Publishing Company, 335-354.

Soares ER, Lock LF. 1980. Lack of indication of mutagenic effects of dinitrotoluenes and diaminotoluenes in mice. Environ Mutagen 2:111-124.

Sohr J, Janes W, Bongartz A. 1995. TLC analysis of nitro compounds in residual warfare site contamination. Analysis Magazine 23:M25-M26.

Sorenson DR, Brabec M. 2003. The response of adult rat Sertoli cells, immortalized by a temperature-sensitive mutant of SV40, to 1,2-dinitrobenzene, 1,3-dinitrobenzene, 2,4-dinitrotoluene, 3,4-dinitrotoluene, and cadmium. Cell Biol Toxicol 19(2):107-119.

Spanggord RJ, Suta BE. 1982. Effluent analysis of wastewater generated in the manufacture of 2,4,6-trinitrotoluene 2. Determination of a representative discharge of ether extractable components. Environ Sci Technol 16:233-236.

Spanggord RJ, Gibson BV, Keck RG, et al. 1982a. Effluent analysis of wastewater generated in the manufacture of 2,4,6-trinitrotoluene 1. Characterization study. Environ Sci Technol 16:229-232.

Spanggord RJ, Mortelmans KE, Griffin AF, et al. 1982b. Mutagenicity in *Salmonella typhimurium* and structure-activity relationships of wastewater components emanating from the manufacture of trinitrotoluene. Environ Mutagen 4:163-179.

Spanggord RJ, Myers CH, LeValley SE, et al. 1990. Structure-activity relationship for the intrinsic hepatotoxicity of dinitrotoluenes. Chem Res Toxicol 3:551-558.

Spanggord RJ, Spain JC, Nishino SF, et al. 1991. Biodegradation of 2,4-dinitrotoluene by a *Pseudomonas sp*. Appl Environ Microbiol 57(11):3200-3205.

Spiegel K, Welsch T. 1997. Monitoring degradation processes of explosives by HPLC analysis with UV- and amperometric detection. Fresenius J Anal Chem 357:333-337.

Spiegel K, Headley JV, Peru KM, et al. 2005. Residues of explosives in groundwater leached from soils at a military site in eastern Germany. Commun Soil Sci Plant Anal 36:133-153.

SRI. 2011. Dinitrotoluenes. 2011 Directory of chemical producers United States. SRI Consulting, 532-533.

Staples CA, Werner AF, Hoogheem TJ. 1985. Assessment of priority pollutant concentrations in the United States using STORET database. Environ Toxicol Chem 4:131-142.

Stayner LT, Dannenberg AL, Bloom T, et al. 1993. Excess hepatobiliary cancer mortality among munitions workers exposed to dinitrotoluene. J Occup Med 35:291-296.

Steuckart C, Berger-Preiss E, Levsen K. 1994. Determination of explosives and their biodegradation products in contaminated soil and water from former ammunition plants by automated multiple development high-performance thin-layer chromatography. Anal Chem 66:2570-2577.

Stoner GD, Greisiger EA, Schut AJ, et al. 1984. A comparison of the lung adenoma response in strain A/J mice after intraperitoneal and oral administration of carcinogens. Toxicol Appl Pharmacol 72:313-323.

Styles JA, Cross MF. 1983. Activity of 2,4,6-trinitrotoluene in an *in vitro* mammalian gene mutation assay. Cancer Lett 20:103-108.

Suzuki H, Imamura T, Koeda A, et al. 2011. Genotoxicity studies of 2,6-dinitrotoluene (2,6-DNT). J Toxicol Sci 36(4):499-505.

Suzuki H, Takasawa H, Kobayashi K, et al. 2009. Evaluation of a liver micronucleus assay with 12 chemicals using young rats (II): A study by the Collaborative Study Group for the Micronucleus Test/Japanese Environmental Mutagen Society-Mammalian Mutagenicity Study Group. Mutagenesis 24(1):9-16.

Sylvia JM, Janni JA, Klein JD, et al. 2000. Surface-enhanced Raman detection of 2,4-dinitrotoluene impurity vapor as a marker to locate landmines. Anal Chem 72(23):5834-5840.

Takasawa H, Suzuki H, Ogawa I, et al. 2010. Evaluation of a liver micronucleus assay in young rats (IV): A study using a double-dosing/single-sampling method by the Collaborative Study Group for the Micronucleus Test (CSGMT)/Japanese Environmental Mutagen Society (JEMS)-Mammalian Mutagenicity Study Group (MMS). Mutat Res 698(1-2):24-29.

Tas S, Lauwerys R, Lison D. 1996. Occupational hazards for the male reproductive system. Crit Rev Toxicol 26:261-307.

Thomas K, Colborn T. 1992. Organochlorine endocrine disruptors in human tissue. In: Colborn T, Clement C, eds. Chemically induced alterations in sexual and functional development: The wildlife/human connection. Princeton, NJ: Princeton Scientific Publishing, 365-394.

Tokiwa H, Nakagawa R, Ohnishi Y. 1981. Mutagenic assay of aromatic nitro compounds with *Salmonella typhimurium*. Mutat Res 91:321-325.

TRI13. 2015. TRI explorer: Providing access to EPA's toxics release inventory data. Washington, DC: U.S. Environmental Protection Agency, Office of Information Analysis and Access, Office of Environmental Information. Toxics Release Inventory. http://www.epa.gov/triexplorer/. April 3, 2015.

Turner MJ. 1986. Identification and quantification of urinary metabolites of dinitrotoluenes in occupationally exposed humans. Chemical Industry Institute of Toxicology Activities 6:1-5.

Turner MJ, Levine RJ, Nystrom DD, et al. 1985. Identification and quantification of urinary metabolites of dinitrotoluenes in occupationally exposed humans. Toxicol Appl Pharmacol 80:166-174.

U.S. Army. 1975. Mammalian toxicity of munition compounds: Phase I. Acute oral toxicity, primary skin and eye irritation, dermal sensitization, and disposition and metabolism. Report No. 1. Washington, DC: U.S. Army, Medical Research and Development Command. ADB011150. http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADB011150. June 22, 2012.

U.S. Army. 1976. Mammalian toxicity of munitions compounds. Phase II: Effects of multiple doses. Part III: 2,6-Dinitrotoluene. Progress report no. 4. Fort Detrick, MD: U.S. Army, Medical Bioengineering Research and Development Laboratory. ADA062015. http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA062015. June 22, 2012.

U.S. Army. 1978a. Mammalian toxicity of munitions compounds. Phase I. Acute oral toxicity, primary skin and eye irritation, dermal sensitization, disposition and metabolism and Ames tests of additional compounds. Progress report no. 6. Fort Detrick, MD: U.S. Army, Medical Bioengineering Research and Development Laboratory. ADA069333. http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA069333. June 22, 2012.

U.S. Army. 1978b. Mammalian toxicity of munitions compounds. Phase II: Effects of multiple doses. Part II: 2,4-Dinitrotoluene. Progress report no. 3. Fort Detrick, MD: U.S. Army, Medical Bioengineering Research and Development Laboratory. ADA061715. http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA061715. June 22, 2012.

U.S. Army. 1979. Mammalian toxicity of munitions compounds. Phase III: Effects of lifetime exposure. Part I. 2,4-Dinitrotoluene. Final report no. 7. Fort Detrick, MD: U.S. Army and Medical Bioengineering Research Development Laboratory. ADA077692. http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA077692. June 22, 2012.

U.S. Army. 1980. Environmental fate studies on certain munition wastewater constituents - literature review. U.S. Army Medical Bioengineering R&D Laboratory, Environmental Protection Research Division.

U.S. Army. 1987. Water quality criteria for 2,4-dinitrotoluene and 2,6-dinitrotoluene. Fort Detrick, MD: U.S. Army Medical Research and Development Command. ADA187745.

U.S. Army. 1990. An evaluation of the environmental fate and behavior munitions material (TNT, RDX) in soil and plant systems; environmental fate and behavior of TNT. Fort Detrick, MD: U.S. Army Medical Research and Development Command. ADA223546.

U.S. Army. 1998. Analysis of explosives in plant tissues: Modifications to method 8330 for soil. Washington, DC: U.S. Army Corps of Engineers. IRRP-98-5. http://www.dtic.mil/dtic/tr/fulltext/u2/a348746.pdf. June 19, 2012.

9. REFERENCES

USAPHC. 2011a. Toxicology Study No. 87-XE-08G0A-08, October 2011, Toxicology Portfolio. Fourteen-day oral toxicity and in vivo genotoxicity of 2,3-dinitrotoluene in rats, June-July 2008. Aberdeen Proving Ground, Maryland: U.S. Army Public Health Command.

USAPHC. 2011b. Toxicology Study No. 87-XE-08G0D-10, October 2011, Toxicology Portfolio. Fourteen-day oral toxicity and in vivo genotoxicity of 2,4-dinitrotoluene in rats, January 2009-March 2010. Aberdeen Proving Ground, Maryland: U.S. Army Public Health Command.

USAPHC. 2011c. Toxicology Study No. 87-XE-08G0E-10, October 2011, Toxicology Portfolio. Fourteen-day oral toxicity and in vivo genotoxicity of 2,5-dinitrotoluene in rats, January 2009-March 2010. Aberdeen Proving Ground, Maryland: U.S. Army Public Health Command.

USAPHC. 2011d. Toxicology Study No. 87-XE-08G0C-08, October 2011, Toxicology Portfolio. Fourteen-day oral toxicity and in vivo genotoxicity of 2,6-dinitrotoluene in rats, June-July 2008. Aberdeen Proving Ground, Maryland: U.S. Army Public Health Command.

USAPHC. 2011e. Toxicology Study No. 87-XE-08G0B-08, October 2011, Toxicology Portfolio. Fourteen-day oral toxicity and in vivo genotoxicity of 3,4-dinitrotoluene in rats, June-July 2008. Aberdeen Proving Ground, Maryland: U.S. Army Public Health Command.

USAPHC. 2011f. Toxicology Study No. 87-XE-08G0F-10, October 2011, Toxicology Portfolio. Fourteen-day oral toxicity and in vivo genotoxicity of 3,5-dinitrotoluene in rats, January 2009-March 2010. Aberdeen Proving Ground, Maryland: U.S. Army Public Health Command.

USITC. 1987. Synthetic organic chemicals: United States production and sales, 1986. Washington, DC: U.S. International Trade Commission, 24-42.

U.S. Navy. 1972. Analysis of explosives in sea water and in ocean floor sediment and fauna. Naval Ordinance Laboratory. Ad757778.

U.S. Navy. 1977. The effects of light on TNT and other explosives in aqueous solutions. WQEC/C 77 32. ADA036132.

Valli K, Brock BJ, Joshi DK et al. 1992. Degradation of 2,4-dinitrotoluene by the lignin-degrading fungus *Phanerochaete chrysosporium.* Appl Environ Microbiol 58(1):221-228.

Vernot EH, MacEwen JD, Haun CC, et al. 1977. Acute toxicity and skin corrosion data for some organic and inorganic compounds and aqueous solutions. Toxicol Appl Pharmacol 42:417-423.

Vieira I, Sonnier M, Cresteil T. 1996. Developmental expression of CYP2E1 in the human liver: Hypermethylation control of gene expression during the neonatal period. Eur J Biochem 238(2):476-483.

Wallenborg SR, Marikides KE, Nyholm L. 1997. Oxidative and reductive amperometric detection of phenolic and nitroaromatic compounds in packed capillary column supercritical fluid chromatography. J Chromatogr A 785:121-128.

West JR, Smith HW, Chasis H. 1948. Glomerular filtration rate, effective renal blood flow, and maximal tubular excretory capacity in infancy. J Pediatr 32:10-18.

WHO. 2008. Guidelines for drinking-water quality. 3rd ed. Geneva, Switzerland: World Health Organization. http://www.who.int/entity/water_sanitation_health/dwq/fulltext.pdf. April 25, 2012.

WHO. 2010. Guidelines for indoor air quality: Selected pollutants. Geneva, Switzerland: World Health Organization. http://www.euro.who.int/__data/assets/pdf_file/0009/128169/e94535.pdf. September 9, 2014.

WHO. 2011. Guidelines for drinking-water quality. Geneva, Switzerland: World Health Organization. http://whqlibdoc.who.int/publications/2011/9789241548151_eng.pdf?ua=1. September 9, 2014.

Widdowson EM, Dickerson JWT. 1964. Chemical composition of the body. In: Comar CL, Bronner F, eds. Mineral metabolism: An advanced treatise. Volume II: The elements Part A. New York, NY: Academic Press, 1-247.

Wilbanks MS, Gust KA, Atwa S, et al. 2014. Validation of a genomics-based hypothetical adverse outcome pathway: 2,4-Dinitrotoluene perturbs PPAR signaling thus impairing energy metabolism and exercise endurance. Toxicol Sci 141(1):44-58.

Woodruff RC, Mason JM, Valencia R, et al. 1985. Chemical mutagenesis testing in *Drosophila*. V. Results of 53 coded compounds tested for the National Toxicology Program. Environ Mutagen 7:677-702.

Woollen BH, Hall MG, Craig R, et al. 1985. Dinitrotoluene: An assessment of occupational absorption during the manufacture of blasting explosives. Int Arch Occup Environ Health 55:319-330.

Working PK, Butterworth BE. 1984. An assay to detect chemically induced DNA repair in rat spermatocytes. Environ Mutagen 6:273-286.

Xin Y, He G, Wang Q, et al. 2011. A portable fluorescence detector for fast ultra trace detection of explosive vapors. Rev Sci Instrum 82(10):103102. 10.1063/1.3642661.

Yang H, Halasz A, Zhao JS, et al. 2008. Experimental evidence for *in situ* natural attenuation of 2,4- and 2,6-dinitrotoluene in marine sediment. Chemosphere 70(5):791-799.

Yang L, Xu JB, Zhen L, et al. 2005. DNA damage of germ cell of rat induced by nitrotoluene chemicals. J Environ Sci (China) 17(1):84-90.

Yinon J. 1996. Trace analysis of explosives in water by gas chromatography-mass spectrometry with a temperature-programmed injector. J Chromatogr A 742:205-209.

Yook KS, Hong SM, Kim JH. 1994. Comparison of liquid-liquid extraction and solid-phase extraction coupled with GC/MS for determination of priority pollutants in water. Anal Sci Technol 7:441-453.

Young WS III, Lietman PS. 1978. Chloramphenicol glucoronyl transferase: Assay, ontogeny and inducibility. J Pharmacol Exp Ther 204:203-211.

Ziegler EE, Edwards BB, Jensen RL, et al. 1978. Absorption and retention of lead by infants. Pediatr Res 12(1):29-34.