Abbreviations, Search terms and References

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Abbreviations

AGA	Adequate for gestational age
ATSDR	Agency for Toxic Substances and Disease Registry
BMD	Benchmark Dose
BMDL01	Benchmark Dose Lower Limit for 1% change in effect
BPb	Blood lead concentration

CI	Confidence interval
CLEA	Contaminated Land Exposure Assessment
COT	Committee on Toxicity
DNA	Deoxyribonucleic acid
DWI	Drinking Water Inspectorate
DWQR	Drinking Water Quality Regulator
EFSA	European Food Safety Authority
FSA	Food Standards Agency
IQ	Intelligence Quotient
JECFA	Joint FAO/WHO Committee on Food Additives
kPa	KiloPascals
L	Litre
MDI	Mental development index
mmHg	Millimetres of mercury
MOE	Margin of exposure
NDNS	National Diet and Nutrition Survey

OR	Odds ratio
Pb	Lead
SBP	Systolic blood pressure
SD	Standard deviation
SGA	Small for gestational age
µg	Microgram

Search terms

The references cited in this discussion paper are of publications found in PubMed searches and references therein, using the following search terms:

Pb AND

Maternal health

Pre-conception

Conception

Post-partum

Toxicity

Mechanism

ADME

Toxicokinetics

Absorption

Distribution

Metabolism

Excretion

Biomarker

Exposure

Pre-eclampsia

Abortion

Pica

Pica AND Pregnancy

Soil AND Pregnancy

References

ATSDR (2020) Toxicological profile for lead (update). (Agency for Toxic Substances and Disease Registry.) U.S. Department of Health and Human Services, Atlanta, GA.: ATSDR Lead Tox Profile (cdc.gov)

Ander EL, Johnson CC, Cave MR, and Palumbo-Roe B. 2011. Normal background concentrations of contaminants in the soils of England. Available data and data exploration. British Geological Survey Commissioned Report, CR/11/145. 124pp: Normal background concentrations of contaminants in English and Welsh soils - British Geological Survey (bgs.ac.uk)

Barregård, L. et al. Cadmium, mercury, and lead in kidney cortex of the general Swedish population: a study of biopsies from living kidney donors. Environmental Health Perspectives 1999 **107**(11), 867.

Barry PS. A comparison of concentrations of lead in human tissues. Occupational and Environmental Medicine 1975 **32**(2): 119–139.

Bolan S, Seshadri B, Keely S, Kunhikrishnan A, Bruce J, Grainge I, Talley NJ, Naidu R. Bioavailability of arsenic, cadmium, lead and mercury as measured by intestinal permeability, Scientific Reports. 2021 **11**(1):14675.

Borja-Aburto VH, Hertz-Picciotto I, Rojas Lopez M, Farias P, Rios C, Blanco J. Blood lead levels measured prospectively and risk of spontaneous abortion. American Journal of Epidemiology 1999 Sep 15;150(6):590-7.

Bound J, Harvey P, Francis B, Awwad F, Gatrell A. Involvement of deprivation and environmental lead in neural tube defects: a matched case-control study Archives of Disease in Childhood. 1997 **76**(2): 107–112.

Braun J. Erythrocyte zinc protoporphyrin. Kidney International Supplement 1999 **69**: S57-60.

Budtz-Jørgensen E.2010. Scientific/technical report submitted to EFSA. An international pooled analysis for obtaining a benchmark dose for environmental lead exposure in children. (Question No. EFSA-Q-2009-01078) https://doi.org/10.2903/sp.efsa.2010.EN-47

Chen PC, Pan IJ, Wang JD. Parental exposure to lead and small for gestational age births. American Journal of Industrial Medicine. 2006 49(6):417-22.

COT, 2013, Statement on the potential risks from lead in the infant diet, cotstatlead.pdf (food.gov.uk)

COT, 2022, Discussion paper on the effects of lead on maternal health, Effects of Lead on Maternal Health (food.gov.uk)

Defra, 2020, UK Ambient Air Quality Interactive Map (defra.gov.uk). Accessed: 20.04.22.

EFSA Panel on Contaminants in the Food Chain (CONTAM); Scientific Opinion on Lead in Food. **EFSA Journal** 2010; 8(4):1570. [151 pp.]. doi: 10.2903/j.efsa.2010.1570.

Environment Agency, 2009, Microsoft Word - 0901115 CLEA Report for publication.doc (publishing.service.gov.uk). Accessed 20.04.22.

Fawcett E, Fawcett J, Mazmanian D. A meta-analysis of the worldwide prevalence of pica during pregnancy and the postpartum period, International Journal of Gynecology & Obstetrics 2016 133(3): 277-283.

Flora G, Gupta D, Tiwari A. Toxicity of lead: A review with recent updates. Interdisciplinary Toxicology 2012 **5**(2):47-58.

Forbes G, Reina J, Effect of Age on Gastrointestinal Absorption (Fe, Sr, Pb) in the Rat, The Journal of Nutrition 1972 **102(**5): 647–652.

Garza A, Vega R, Soto E. Cellular mechanisms of lead neurotoxicity Medical Science Monitor 2006; **12**(3): RA57-65.

Gerhardsson, L. et al. Lead in tissues of deceased lead smelter workers. Journal of Trace Elements in Medicine and Biology 1995 **9**(3), 36–143.

Glenn BS, Bandeen-Roche K, Lee BK, Weaver VM, Todd AC, Schwartz BS. Changes in systolic blood pressure associated with lead in blood and bone. Epidemiology. 2006 **17**: 538-544.

Glenn BS, Stewart WF, Links JM, Todd AC, Schwartz BS. The longitudinal association of lead with blood pressure. Epidemiology. 2003 **14**: 30-36

Gross, S. B., Pfitzer, E. A., Yeager, D. W. & Kehoe, R. A. Lead in human tissues. Toxicology and Applied Pharmacology 1975 **32**(3), 638–651.

Gulson BL, Jameson CW, Mahaffey KR, Mizon KJ, Korsch MJ, Vimpani G. Pregnancy increases mobilization of lead from maternal skeleton Journal of Laboratory and Clinical Medicine. 1997; **130**(1):51-62.

Hertz-Picciotto I. The evidence that lead increases the risk for spontaneous abortion. American Journal of Industrial Medicine 2000 **38**:300–309.

Hu H, Téllez-Rojo MM, Bellinger D, Smith D, Ettinger AS, Lamadrid-Figueroa H, Schwartz J, Schnaas L, Mercado-García A, Hernández-Avila M. Fetal lead exposure at each stage of pregnancy as a predictor of infant mental development. Environmental Health Perspectives. 2006 **114**(11):1730-5.

Ikechukwu IC, Ojareva OIA, Ibhagbemien, AJ, Okhoaretor OF, Oluwatomi OB, Akhalufo OS, Oluwagbenga AT, Chigaekwu MN. Blood Lead, Calcium, and Phosphorus in Women With Preeclampsia in Edo State, Nigeria. Archives of Environmental & Occupational Health 2012 67(3): 63-69.

JECFA (2011) Evaluation of certain food additives and contaminants: seventy-third report of the Joint FAO/WHO Expert (WHO technical report series; no. 960)1. Meeting (73rd: 2010, Geneva, Switzerland). IV.Series.ISBN 978 92 4 120960 (NLM classification: WA 712) ISSN 0512-3054.

Jelliffe-Pawlowski LL, Miles SQ, Courtney JG, Materna B, Charlton V. Effect of magnitude and timing of maternal pregnancy blood lead (Pb) levels on birth outcomes. Journal of Perinatology 2006; **26**: 154-162.

Karri SK, Saper RB, Kales SN. Lead encephalopathy due to traditional medicines Current Drug Safety 2008 Jan;3(1):54-9.

Lamadrid-Figueroa H, Téllez-Rojo MM, Hernández-Avila M, Trejo-Valdivia B, Solano-González M, Mercado-Garcia A, Smith D, Hu H, Wright RO. Association between the plasma/whole blood lead ratio and history of spontaneous abortion: a nested cross-sectional study. BMC Pregnancy Childbirth 2007 **7**:22.

Lanphear BP, Hornung R, Khoury J, Yolton K, Baghurst P, Bellinger DC, Canfield RL, Dietrich KN, Bornschein R, Greene T, Rothenberg SJ, Needleman HL, Schnaas L, Wasserman G, Graziano J and Roberts R. Low-level environmental lead exposure and children's intellectual function: An international pooled analysis. Environmental Health Perspectives 2005. 113(7): 894-899.

Liu T, Zhang M, Guallar E, Wang G, Hong X, Wang X, Mueller NT, Trace Minerals, Heavy Metals, and Preeclampsia: Findings from the Boston Birth Cohort. Journal of the American Heart Association. 2019 **8**(16): e012436.

Nash D, Magder L, Lustberg M, Sherwin RW, Rubin RJ, Kaufmann RB, Silbergeld EK. Blood lead, blood pressure, and hypertension in perimenopausal and postmenopausal women. Journal of the American Medical Association. 2003 **289**: 1523-1532.

Navas-Acien A, Tellez-Plaza M, Guallar E, Muntner P, Silbergeld E, Jaar B, Weaver V. Blood cadmium and lead and chronic kidney disease in US adults: a joint analysis. American Journal of Epidemiology.2009 **170**: 1156-1164.

Naylor, K.E., Iqbal, P., Fledelius, C., Fraser, R.B. and Eastell, R., The Effect of Pregnancy on Bone Density and Bone Turnover. Journal of Bone and Mineral Research 2009, **15**: 129-137.

Needleman HL. Rabinowitz M. Leviton A. Linn S. Schoenbaum S. The relationship between prenatal exposure to lead and congenital anomalies. Journal of the American Medical Association 1984, **251**, 2956–2959.

Ou J, Peng P, Qiu L, Teng L, Li C, Han J, Liu X. Effect of Lead Exposure on Spontaneous Abortion: A Case-Control Study Clinical Laboratory 2020 **66**(5).

Otte P, Lijzen J, Otte J, Swartjes F, Versluijs C, Evaluation and revision of the CSOIL parameter set. RIVM Report 711701021. Bilthoven: National Institute of Public Health and Environment 2001.

Poropat AE, Laidlaw MAS, Lanphear B, Ball A, Mielke HW, Blood lead and preeclampsia: A meta-analysis and review of implications, Environmental Research 2018 **160** 12–19.

Rădulescu A, Lundgren S. A pharmacokinetic model of lead absorption and calcium competitive dynamics Anca Scientific Repots 2019 **9**:14225.

Sanders T, Liu Y, Buchner V, Tchounwou PB. Neurotoxic Effects and Biomarkers of Lead Exposure: A Review Reviews of Environmental Health. 2009; 24(1): 15–45.

Schroeder, H. A. & Tipton, I. H. The human body burden of lead. Archives of Environmental Health: An International Journal 1968 **17**(6), 965–978.

Taylor CM, Golding J, Emond AM. Adverse effects of maternal lead levels on birth outcomes in the ALSPAC study: a prospective birth cohort study. British Journal of Obstetrics and Gynaecology 2015; **122**:322–328.

UESPA, 1997. Exposure Factors Handbook. August 1997. Washington: United States Environmental Protection Agency.

Vigeh M, Saito H, Sawada S. Lead exposure in female workers who are pregnant or of childbearing age. Indian Health. 2011 **49**(2):255-61. https://doi.org/10.2486/indhealth.ms1192 Epub 2010 Dec 16.

Vupputuri S, He J, Muntner P, Bazzano LA, Whelton PK, Batuman V. Blood lead level is associated with elevated blood pressure in blacks. Hypertension.2003 **41**: 463-468.

Wani AL, Ara A, Usmani JA Lead toxicity: a review, Interdisciplinary Toxicology 2015 **8**(2): 55 - 64.

Wells EM, Navas-Acien A, Herbstman JB, Apelberg BJ, Silbergeld EK, Caldwell KL, Jones RL, Halden RU, Witter FR, Goldman LR. Low-level lead exposure and elevations in blood pressure during pregnancy. Environmental Health Perspectives. 2011 **119**(5):664-9.

WHO, 2000, WHO air quality guidelines for Europe, 2nd edition. WHO/Europe | WHO air quality guidelines for Europe, 2nd edition, 2000 (CD ROM version). Accessed: 22.04.22.

Zentner LEA, Rondó PHC, Mastroeni SSBS. Lead Contamination and Anthropometry of the Newborn Baby **Journal of Tropical Pediatrics,** 2006 **52** (5) 369–371.