Can nutrient supplements reduce long-term effects of lead neurotoxicity?

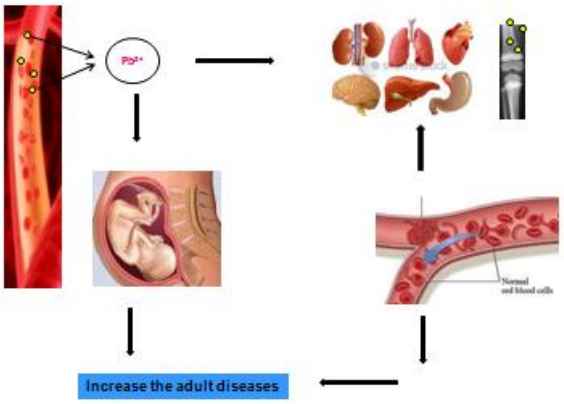
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Abstract (300 word limit)

Lead (Pb) exposure has effects on neurobehavioral functions that vary across the life span. The toxic effects of Pb may be mediated or enhanced by interactions or deficiencies of nutritionally essential metals such as calcium (Ca), zinc (Zn) and iron (Fe), but the role of these supplements against long-term health effects of Pb is ignored. We investigated the protective effects of Ca, Zn and Fe against Pb-induced long-term effects on neurochemistry and behavior of rats. Studies conducted on different age group of rats showed increased levels in synaptosomal acetylcholine (ACh), dopamine and epinephrine whereas acetylcholinesterase (AChE) and mitochondrial monoamine oxidase (MAO) activities decreased in cortex, cerebellum and hippocampus regions following Pb-exposure. Pb exposure showed decrease the hitochemical staining of AChE in CA1, CA2, CA3 regions and denate gyrus of hippocampus; molecular and granule cell layers of cerebellum and also cortical cell layers. Most notably, Pb exposure decreased the mitochondrial oxidative stress marker enzymes such as superoxide dismutase (SOD), catalase (CAT), thioredoxin reductase (TrxR), and aconitase (Acon) while the MDA levels increased in all selected age groups of rats. *In silico* studies revealed that the activity of Acon enzyme greatly altered with Pb interaction. However, Pb-induced alterations in neurochemistry were greater in hippocampus than cortex and cerebellum. Pb exposed rats exhibited deficits in spatial reference memory acquisition, reversal and working memory performance in the Morris water maze test in rats corresponding to the alterations observed in cholinergic and aminergic systems. In addition, supplementation of Ca and Zn individually and mixture of Ca, Zn and Fe along with Pb reversed the Pb-induced alterations in brain chemistry as well as in cognitive functions of rats. Taken together, our observations indicate that the early life exposure to Pb can continue to influence neurobehavioral functions in late life further supplementation of essential nutrients either individual or combinationally greatly reversed the Pb-toxicity in early life while marginal protection in late life suggesting therapeutic efficacy of nutrient supplements for Pb-toxicity.

Image



Long- term health effects of Pb

Recent Publications (minimum 5)

1. D. Chand Basha and G. Rajarami Reddy (2015). Long term changes in brain cholinergic system and behavior in rats following gestational exposure to lead: Protective effect of calcium supplement. Interdisciplinary toxicology. 8(4):101-110.
2. G. Rajarami Reddy and D. Chand Basha (2014). Perinatal Exposure to Lead: Reduction in Alterations of Brain Mitochondrial Antioxidant System with Calcium Supplement. Biological Trace Element Research. 162, 1-3, 270-277.
3. D. Chand Basha, N. Saya Reddy, and G. Rajarami Reddy (2014). Age related changes in aminergic system and behavior following lead exposure: protection with essential metal supplements. Neuroscience Research. 78; 81-9. (Published in special issue).
4. D. Chand Basha, Sadak Basha. S and Rajarami Reddy. G. (2012). Lead induced cardiac and hematological alterations in aging Wistar rats: Alleviating effects of nutrient metal mixture. Biogerentology. 13, (4), 359-368. ISSN No: 1573-6768.
5. D. Chand Basha, M. Usha Rani, C. Bhuvaneswari Devi, M. Ram Kumar and G. Rajarami Reddy. (2012). Perinatal lead exposure alters postnatal cholinergic and aminergic system in rat brain: Reversal effect of calcium-co administration. International Journal of Developmental Neuroscience. 30 (2012) 343–350. ISSN No: 0736-5748.



Biography

Dr. Chand Basha Davuljigari, is working as a Scientist, Department of Zoology at Sri Venkateswara University, Tirupati, India. Dr. Basha has contributed significantly in the area of therapeutic measures for the treatment of metal poisoning particularly lead, manganese and arsenic and has established the therapeutic potential of essential metal supplements to reverse heavy metal toxicity. He has published several research papers in reputed peer reviewed journals, including Neuroscience Research, Biogerentology, and International Journal of Developmental Neuroscience etc.,. His research work chosen for several international and national awards including Excellent research and presentation award from Japan Neuroscience Society (JNS), American College of Toxicology (ACT) travel award, European society of toxicology young scientist travel award, CAEN grant from International Society for Neurochemistry (ISN), International grant support from International Brain Research Organization (IBRO), Junior Scientist of the Year award from NESA, India etc… Apart from several invited Talks delivered in special symposia in Spain, China, Australia and India further chosen for several international and national society memberships.

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Notes/Comments: