

Prof Deborah Cory-Slechta
Environmental and Occupational Health Sciences Institute
170 Frelinghuysen Road Piscataway
New Jersey United States
Email: dcs@eoehsi.rutgers.edu

Impact of early lead exposure on hypothalamic-pituitary-adrenal axis function

D. A. Cory-Slechta*, M. Virgolini, and A. Rossi-George (Environmental and Occupational Health Sciences Institute, a joint Institute of the Robert Wood Johnson Medical School and Rutgers University, Piscataway, NJ, USA, 08854).

The highest lead (Pb) levels in the US occur in low socioeconomic status (SES) children.

Both stress hormones (via activation of the hypothalamic-pituitary-adrenal (HPA) axis) and Pb act on the mesocorticolimbic dopamine pathway that mediates the complex cognitive functions disrupted by Pb. These facts raise questions as to whether Pb and stress interact. Our recent studies in rats demonstrate that stress can modify Pb effects, that Pb can modify stress responsivity, and that effects of Pb+stress can occur in the absence of an effect of either alone. Further, maternal only Pb exposure can permanently alter basal corticosterone levels and stress responsivity (i.e., permanent modification of HPA axis function) and brain catecholamines in offspring of both genders. Interactive effects of Pb+stress are not limited to early development: even Pb exposures initiated postweaning alter basal corticosterone and stress responsivity. Outcomes differ in relation to gender, brain region, stressor, and time of measurement, making Pb+stress interactions complex. However, females often demonstrate greater sensitivity than males. Altered HPA axis function may serve as a mechanism for the behavioural and catecholamine neurotoxicity associated with Pb, as well as for the increased incidence of disease and dysfunctions associated with low SES. The permanent consequences of maternal only Pb exposure suggest that Pb screening programs should include pregnant women, and that stress should be considered as an additional risk factor. Pb+stress effects observed in the absence of either risk factor alone raise questions about the capacity of current risk assessment methods to adequately identify human health risks.