Boys genetically more prone to mercury-induced neurobehavioral effects

SEATTLE, Wash., USA: According to the World Health Organization, neurological and behavioural disorders may be observed after inhalation or ingestion of different mercury compounds. Researchers from the University of Washington’s Department of Environmental and Occupational Health Sciences have now suggested that children and boys in particular are susceptible to the effects of mercury from dental amalgam fillings owing to their genetic predisposition.

They hypothesised that CPOX4, a genetic variant of the enzyme cytoporphyrinogen oxidase, which increases sensitivity to the neurobehavioural effects of mercury in adults, also influences the neurotoxic effects of mercury in children.

In order to evaluate the neurobehavioural effects of mercury from amalgam tooth fillings, they assessed neurobehavioural performance and urinary mercury levels in 750 schoolchildren (164 boys and 166 girls) at baseline and at seven subsequent annual intervals after initial placement.

According to the researchers, performance in all five tested domains of neurobehavioural decrees with increasing mercury exposure in males with the CPOX4 variant. Significant mercury dose-response effects were observed in 11 of the 23 test outcomes, all in the direction of impaired performance. In contrast, no such relationship was found in girls, who performed similarly in two tests only.

Among boys, diminished performance was observed in tests of attention, suggesting possible impairment of attentional vitality and flexibility. Significant effects on tests of learning and memory and of visual acuity were also found, suggesting possible decrements of verbal learning and memory, as well as of perceptual cognition.

“These findings are the first to demonstrate genetic susceptibility to the adverse neurobehavioural effects of mercury exposure in children,” the researchers concluded. Since neither mercury nor CPOX4 alone substantially affected neurobehavioural performance in same-age girls, the researchers think that sex-related genetic predisposition affects susceptibility. They recommended that these observations be taken into consideration in risk assessment and prevention, especially in children.

The WHO lists mercury and its compounds as one of the top ten groups of chemicals of major public health concern. In 2009, the organisation recommended a global amalgam phaseout by promoting disease prevention and alternative dental fillings.

While some European countries, such as Norway, Sweden and Denmark, have banned the use of dental amalgam in recent years, its use is still widespread.

The US Food and Drug Administration recognises that high levels of mercury vapour exposure from elemental mercury are associated with adverse effects in the brain and the kidneys. However, owing to low levels of mercury vapour associated with amalgam fillings, the organisation considers them safe for adults and children aged six and above, except for certain risk groups like pregnant women and people with known allergies.

Study data was obtained from the Casa Pia Study of the Health Effects of Dental Amalgam in Children, conducted between 1996 and 2006 with 507 pupils aged 8 to 12 in the Casa Pia school system in Lisbon, Portugal.

The article was published online on July 2 in the Neurotoxicology and Teratology journal ahead of print.