Assessment of Total Mercury Content in Diets and Hair Samples of Pre-School Children from Amazonic Region

LUCIANA A. FARIAS[1], D.I.T.FÁVARO[1]; V.A MAIHARA[1]; M.B.A VASCONCELLOS[1]; JAIME P. L. AGUIAR[2], FERNANDO H. ALENCAR[2] & LUCIA YUYAMA[2]

[1]Laboratório de Análise por Ativação Neutrônica (LAN - CRPQ) – IPEN/CNEN-SP. Av. Professor Lineu Prestes 2242, CEP. 05508-000, São Paulo, Brasil, e-mail: defavaro@curiango.ipen.br
[2]Laboratório de Nutrição e Físico-Química de Alimentos da Coordenação de Pesquisas em Ciências da Saúde, INPA- Manaus, Amazonas, Brasil

Abstract: Latin America, particularly Amazonic region has been considered as one of the most seriously impacted for mercury, due to natural and anthropogenic processes. The presence of mercury in the food chain and its absorption by humans is universally recognized as a potential health hazard. Jaú National Park (JNP) is located 240 km far from Manaus, Amazonas state, and it is considered the biggest park in the world of humid tropical forest. Jaú river, the biggest Park river, is 450 km long and has dark waters, is a Negro river tributary. People from JNP usually live near rivers and their tributaries. In 1999 researchers from INPA (Amazonic Research Brazilian Institute) visited 8 communities in JNP (Seringalzinho (I, II and III), Jacaré (I and II), Cachoeira, Vista Alegre and Santo Elias) in order to evaluate the nutritional and contamination status of pre-school children (from 12 to 60 months). Children´s diet (the total 24 hours consumption) from each community were collected and analyzed to assess Hg content. Scalp hair samples were also collected from children and analyzed. For Hg determination FIA/CV/AAS technique was used and the measurements were performed by FIMS 100 Perkin Elmer equipment. The validation of methodology for diet samples was carried out by reference materials analyzes Typical Diet (NIST SRM 1548a), IAEA-407 (Fish Tissue) and Orchard Leaves (NIST SRM 1571). Relative standard deviation ranged from 2.6 to 5.0 % and relative error from 2.7 to 4.0, showing good precision and accuracy. Only for Typical Diet reference material the relative standard deviation was 20 % due to its low Hg concentration (5 µg kg-1). For hair samples the reference materials GBW, IAEA-085 and BCR CRM 397 were analyzed. Relative standard deviation ranged from 0.1 to 5.0 % and relative error from 4.6 to 8.0, showing good precision and accuracy as well. The results for Hg concentration in the diets of communities from JNP ranged from 163 to 803 µg kg^{-1}. When daily intake values of each group of children were calculated, values ranging from 18 to 81 µg/day were found. When the provisional tolerable weekly intake (PTWI) was calculated for each group considering an average of 10 kg of body weight per child, the values varied from 13 to 57 µg Hg/kg, exceeding the limit of 5 µg Hg/kg of body weight set by WHO. The results for Hg in hair samples varied from 0.6 to 42 mg kg^{-1}, showing a median value of 20.8 µg kg-1, considered too high when compared with values obtained for normal Brazilian population (1 µg kg^{-1}). The high Hg levels in diets and hair samples obtained in the present work seem to be indicative of mercury environmental impact at Jaú National Park and the occurrence of children exposure levels that may lead to adverse health effects.

Key words: Total mercury, human hair, diets