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Selenium - mercury antagonism in human blood samples from residents of Wassa West District, a mining area in Ghana - Victus Samlafo - University of Education Winneba

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Abstract

This paper sought to evaluate Se to Hg (Se:Hg) molar ratio in human blood samples from residents of Wassa West district of Ghana, a region which has a long history of gold mining.Determining Hg levels alone in either environmental samples or human body fluids or tissues is necessary but not essential enough to assess the health risk of a given population. The levels of Se in such matrices are the fundamental factor in health risk assessment of Hg exposure and toxicity. Fifty blood samples were collected from volunteers from Wassa West District and were analysed for Hg and Se concentrations. The molar concentrations of each element was calculated and the corresponding Se:Hg molar ratios were determined. The results indicated that, the molar concentrations of Se ranged from 0,35 nM to 62.38 nM with a mean value of 25.26 nM, while Hg molar concentrations ranged from 0.05 nM to 4.65 nM with a mean value of 0.38 nM. The ratios ranged from 0.97 to 958.8 with a mean value of 155.40. Apart from, one subject, all the Se:Hg molar ratios were above one, which may imply that the residents have enough Se (well nourished) to prevent Hg toxicity.The precision and accuracy of the analytical methods were determined by the standard reference materials, DORM-2 and GBW 09101. The measurement precision which was determined using relative standard deviation fell within 4%.The results of the analysed samples were within ±5% of the certified values of the standard reference materials.

Mercury (Hg) is an ecological contaminant of extraordinary concern attributable to its determination in the earth; human and untamed life exposures are normal, with perceived poisonous effects, making it imperative to comprehend factors that can intercede Hg poisonousness. Hg exists normally in the earth yet additionally has impressive anthropogenic assembly, with mechanical data sources expected to increment in the future. In the earth, Hg exists in three principle synthetic structures: natural Hg(0), inorganic divalent Hg(II), and natural structures, for example, monomethylmercury (MeHg) most of human exposures are to inorganic and natural Hg through word related and dietary courses, separately. Concoction speciation is critical to harmfulness; for instance, unsafe effects on the anxious and conceptive frameworks are related with MeHg introduction, and negative renal framework impacts are related with inorganic Hg exposure. Hg poisonousness can likewise be adjusted by an assortment of different components, including selenium coexposure.

Selenium (Se), like Hg, is a normally happening component in the earth, however not at all like Hg, Se is an essential micronutrient. It is essential for the best possible capacity of selenoenzymes, which have significant jobs including cell reinforcement capacities. Because of its natural significance, natural Se (e.g., selenomethionine) and inorganic Se (e.g., selenate, selenite) have ordinarily been utilized in human and creature supplements. Nonetheless, despite the fact that Se is required at low levels, it has an extremely limited helpful list and is poisonous at higher fixations. The cooperation among Hg and Se is intricate and has ordinarily been portrayed as adversarial, with Se exposures being able to moderate Hg toxicity. Conversely, synergistic impacts have additionally been observed The distinction among hostile and synergistic effects may result from the concoction species and dosing focuses utilized and may rely upon the living being and organic result inspected. Be that as it may, the components that underlie either connection are not surely known.

Proposed systems for enmity include: decreases in bioavailable Hg because of Hg–Se complex development (i.e., diminished take-up); diminished circulation to target tissues or expanded discharge of Hg because of Hg–Se complex arrangement; and improved cancer prevention agent work, as certain cell reinforcements are Se-subordinate proteins (ex. glutathione peroxidase, GPX; thioredoxin reductase, TrxR), and supplemental Se could lessen the Hg-prompted consumption of selenoenzymes. Related to the initial two theories, it has been explicitly hypothesized that the defensive impacts of Se happen when the molar Se/Hg molar proportion is ≥1 in light of the fact that Se may decrease the natural accessibility of Hg through physical sequestration because of the high partiality among Hg and Se. Potential components for synergism are less clear, yet may incorporate adjusting cancer prevention agent capacities, in this manner advancing a prooxidative environment.