Mercury and Infectious Disease: Interacting Risks

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Mercury compounds (Hg) are well characterized toxicants, and regulations are based primarily on preventing developmental neurotoxicity in children associated with prenatal exposures. However, both inorganic and methyl Hg also affect the immune system in rodent models, resulting in significant immunosuppression and autoimmune pathophysiology, depending upon dose and strain. We hypothesize that these effects may be linked, specifically in terms of post-infection autoimmune disease, such as those associated with Coxsackie B virus, T. cruzii, or campylobacteriosis. For these reasons we have examined interactions between Hg exposures and infectious agents in both humans and mice. Pre-exposure of mice to very low levels of Hg (10–100 μg/kg) results in substantial acceleration of both lupus-like disease and of autoimmune myocarditis. Associations between Hg and autoimmune disease in humans are not well studied, although two recent case:control studies in the US support an association between systemic lupus erythematosus or scleroderma and Hg exposures. We have examined cohorts in Amazonian Brazil, who are exposed to Hg through gold mining and fish consumption, in the Tapajós region of the state of Pará. Adult subjects were enrolled from three sites: a group exposed to inorganic mercury at a gold mine (garimpo), recruited as a convenience sample; a group from a riverine settlement (enrolled on a census basis), who were consumers of mercury-contaminated fish; and a group from a different riverine settlment (also enrolled on a census basis), with no impacts of mercury on fish. Overall, across these cohorts and within the two mercury-exposed cohorts, there was a significant and dose-related association between exposure to MeHg or iHg and increases in circulating levels of autoantibodies (antinuclear and antinucleolar autoantibodies, measured by indirect immunofluorescence). No consistent increase was observed in antifibrillarin autoantibodies, although these have been proposed as relatively specific biomarkers for Hg-induced autoimmunity. In a separate study of miners from Goias, we found evidence for an apparently persistent effect of past mercury exposures on autoantibody levels, observable years after exposure ceased. We examined the role of other risk factors for this observation, especially since these populations are at variable risk for malaria infection. Prevalent malaria (observed in the gold miners) by itself did not affect these autoantibodies, but malaria infection positively modifies the effects of Hg. These results suggest that some important health effects of Hg may not be considered in current programs to reduce exposure to specific groups in the population. *Research supported by CAN Foundation, Heinz Family Foundation, NHLBI-NIH, FNS-Brasil.*