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COVID-19 Heavy Metal Hypothesis

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Abstract

The bioaccumulation of heavy metals potentially makes certain individuals susceptible to COVID-19

A distinct feature of COVID-19 is that the majority of people infected fight it off effectively with few or no symptoms presented[1]. The typical immune response is more than sufficient to overcome the virus. There is however a small section of the population that is not able to do that and tragically succumb. There is something different about this subset of the population. We know conditions that increase your risk for succumbing to the virus are age, hypertension, obesity, and diabetes[2]. Interestingly all of these conditions are also associated with the bioaccumulation of heavy metals. Seniors have significantly higher heavy metal levels in their blood than young people because each year you typically retain more than you excrete[3]. Heavy metals increase risk for hypertension[4][5][6][7]. The relationship between mercury and hypertension is strong enough that Houston (2011) states "Mercury toxicity should be evaluated in any patient with hypertension." Heavy metals have a demonstrated association with diabetes and obesity as well. [8][9][10][11] In addition, COVID-19 deaths appear to be related to the immune system launching a "cytokine storm"[12], excessive levels of cytokines are

released triggering a chain of events that can kill the patient. Mercury increases the cytokine response by increasing the proinflammatory cytokines interleukin-1 β (IL-1 β) at the heart of COVID-19 induced “cytokine storm”[13][14][15]. Endemen et al (2020) found that COVID-19 may be associated with hypercoagulability[16]. This is one of the known effects of mercury[17]. My hypothesis is that bioaccumulation of heavy metals is making certain individuals more susceptible to succumbing to COVID-19 with mercury being the most likely candidate.

There are many sources of mercury contamination in our environment, mining, agriculture, coal-fired power plants, municipal wastewater discharges to name a few. I first became aware of the ubiquity of mercury contamination when researching fish in California waterways. I was surprised to learn that the San Francisco Bay is still contaminated with mercury from the gold rush that occurred in 1849[18]. Seafood, dental amalgams and skin lightening creams are a major source of mercury exposure in the United States[19][20][21]. Since the consumption of those products varies widely between individuals the bioaccumulation of mercury also varies widely. That means certain individuals have very high levels of mercury relative to the rest of the population. Is it these individuals who are succumbing to infection with COVID-19? Science creates falsifiable hypotheses. If heavy metals are making people susceptible to COVID-19, those with an adverse reaction should have higher levels of heavy metals than those who do not have an adverse reaction. This is an easily testable and falsifiable hypothesis. I’m proposing that we create a study to compare heavy metal levels in the two groups. The effects of mercury are consistent with the evidence so it is the most likely culprit.

If it turns out that heavy metals are causing a vulnerability to COVID-19 then we have gained an invaluable tool for identifying who is at risk and a method to proactively reduce risk.

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[3] Government of Canada, “Lead, Mercury and Cadmium Concentrations in Canadians, 2012 and 2013.”

[4] Houston, “Role of Mercury Toxicity in Hypertension, Cardiovascular Disease, and Stroke.”

[5] Jaishankar et al., “Toxicity, Mechanism and Health Effects of Some Heavy Metals.”

[6] Alghasham, Meki, and Ismail, “Association of Blood Lead Level with Elevated Blood

Pressure in Hypertensive Patients.”

[7] Hu, Singh, and Chan, “Mercury Exposure, Blood Pressure, and Hypertension.”

[8] Kolachi et al., “Status of Toxic Metals in Biological Samples of Diabetic Mothers and Their Neonates.”

[9] Tsai et al., “Type 2 Diabetes Occurrence and Mercury Exposure – From the National Nutrition and Health Survey in Taiwan”;

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[11] Wang, Mukherjee, and Park, “Associations of Cumulative Exposure to Heavy Metal Mixtures with Obesity and Its Comorbidities among U.S. Adults in NHANES 2003-2014.”

[12] Jose and Manuel, “COVID-19 Cytokine Storm.”

[13] Gardner et al., “Mercury Induces an Unopposed Inflammatory Response in Human Peripheral Blood Mononuclear Cells in Vitro.”

[14] Lubick, “IMMUNITY.”

[15] Silva et al., “Mercury Exposure, Malaria, and Serum Antinuclear/Antinucleolar Antibodies in Amazon Populations in Brazil.”

[16] Endeman et al., “Progressive Respiratory Failure in COVID-19.”

[17] Lim et al., “Low-Level Mercury Can Enhance Procoagulant Activity of Erythrocytes.”

[18] “Mercury Contamination from Historical Gold Mining in California.”

[19] Xun et al., “Distributions and Determinants of Mercury Concentrations in Toenails among American Young Adults.”

[20] Parkin Kullmann and Pamphlett, “A Comparison of Mercury Exposure from Seafood Consumption and Dental Amalgam Fillings in People with and without Amyotrophic Lateral Sclerosis (ALS).”

[21] McKelvey et al., “Tracking Declines in Mercury Exposure in the New York City Adult Population, 2004–2014.”