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# Is Mercury Causing COVID-19 Deaths?

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## Abstract

Hypothesis: Mercury is making people susceptible to COVID-19 death.

A characterizing feature of coronavirus disease 2019 (COVID-19) is that the majority of people infected fight it off effectively with few or no symptoms presented.<sup>1–5</sup> 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.<sup>6</sup> 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.<sup>7</sup> Heavy metals increase risk for hypertension.<sup>8–12</sup> Mercury causes hypertension by inactivating catecholamine-0-methyltransferase, which increases serum and urinary epinephrine, norepinephrine, and dopamine. This effect increases blood pressure.<sup>8</sup> This relationship is so well understood 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.<sup>13–17</sup> In addition, COVID-19 deaths appear to be related to the immune system launching a “cytokine storm” excessive levels of cytokines are released triggering a chain of events that can kill the patient.<sup>18</sup> Mercury alters the cytokine response by increasing proinflammatory cytokines. Intriguingly, the relationship is even more specific than that, interleukin-1 $\beta$  (IL-1 $\beta$ ) cytokines are at the heart of COVID-19 induced cytokine

storms, these are the exact cytokines that mercury increases.<sup>19–21</sup> Endemen et al (2020) found that COVID-19 is linked to hypercoagulability.<sup>22</sup> This conclusion is supported by cohort studies that found hypercoagulability and a severe inflammatory state in COVID-19 patients.<sup>23,24</sup> Hypercoagulability is one of the known effects of mercury.<sup>25–27</sup> Viral infections activate the blood coagulation system.<sup>28</sup> Coagulation stimulates the cytokine response and the expression of IL-1 $\beta$  genes.<sup>29,30</sup> My hypothesis is that bioaccumulation of heavy metals is making certain individuals more susceptible to succumbing to COVID-19. A hypothetical mechanism is illustrated in Figure 1. Mercury induced hypercoagulation is touched off by COVID-19 infection. Coagulation induces proinflammatory cytokine response exacerbated by mercury causing a cytokine storm.

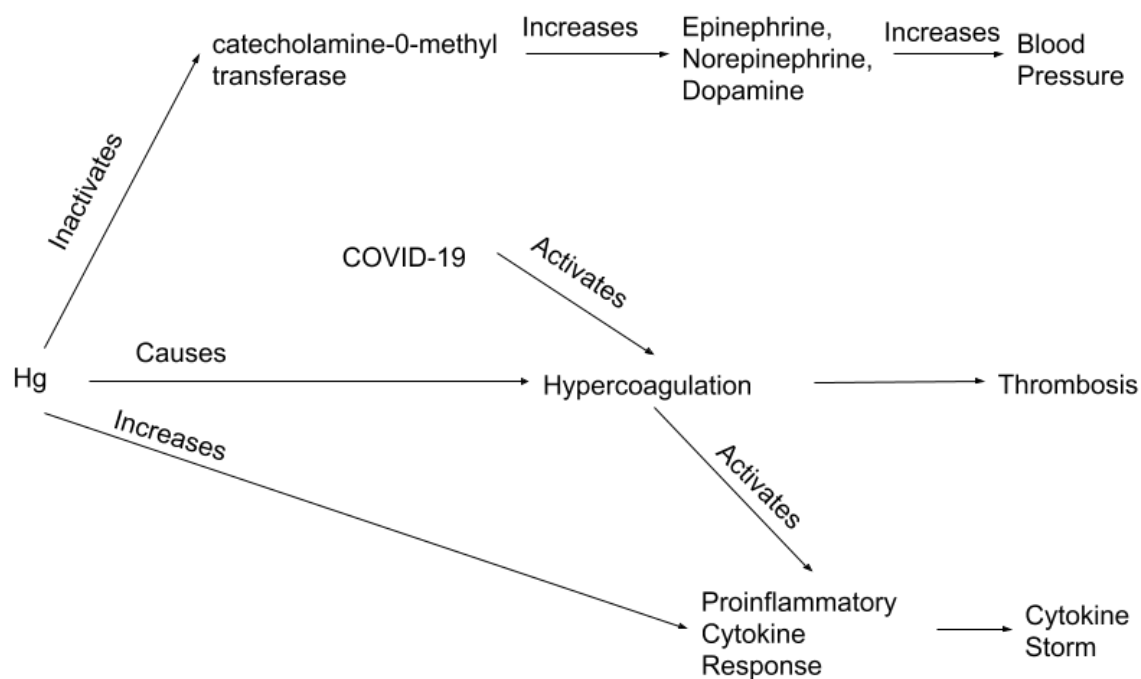


Figure 1. Mercury (Hg) causes hypertension by inactivating catecholamine-O-methyltransferase. Mercury toxicity is known to cause hypercoagulation and a proinflammatory cytokine response as well. Illustrated is the hypothesized mechanism by which it is interacting with COVID-19 to lead to patient mortality.

Lymphopenia, a below normal number of lymphocytes, has been of interest since the outset of the pandemic.<sup>31</sup> Tan et al (2020) documented that lymphopenia predicts the severity of COVID-19 disease.<sup>32</sup> Lymphopenia is associated with COVID-19 death and acute respiratory distress syndrome (ARDS).<sup>33</sup> Gallais et al (2020) illustrate a mechanism for this effect as viral-specific T cell response is primary in fighting COVID-19 infection.<sup>5</sup> Interestingly, methylmercury causes T cell

death.<sup>34</sup> Mercury is not the only heavy metal to interfere with immune function, arsenic and lead are also infamous for immunosuppression.<sup>35–40</sup>

One aspect of the pandemic that's been particularly puzzling is that men are more likely to die from COVID-19 infection than women.<sup>41,42</sup> Although there has been much speculation as to why, currently there is no known mechanism. Mercury offers a mechanism for the sex skew because it affects males and females differently. Males are more sensitive to mercury because it is potentiated by testosterone.<sup>43–45</sup> The combination of mercury and testosterone should make men more vulnerable to COVID-19 death and therefore skew the deaths toward males.

A variety of heavy metals can enter the human body simultaneously through air, water and food. Although mercury is recognized as the most toxic heavy metal, it rarely enters the body alone. This is important because the bioaccumulation of multiple heavy metals potentiates the effect of mercury.<sup>51–54</sup>

There are many sources of mercury contamination in our environment, mining, agriculture, coal-fired power plants, municipal wastewater discharges to name a few. The San Francisco Bay is still contaminated with mercury from the gold rush that occurred in 1849.<sup>46</sup> Seafood, rice, dental amalgams and skin lightening creams are a major source of mercury exposure in the United States.<sup>47–50</sup> 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?

Coronavirus are frequently innocuous, as is COVID-19 to the majority of people it infects. That opens the possibility that what we are seeing is not a new deadly strain of virus but a virus interacting with an acquired immune disorder. What may be different is not the lethality of the virus but the fact that it is new, highly contagious, spreading rapidly, thereby triggering an avalanche of fatalities amongst those with a heavy metal induced immune disorder.

Science creates falsifiable hypotheses. If heavy metals are making people susceptible to COVID-19, those with an adverse reaction, eg thrombosis and cytokine storm, 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. In addition to saving priceless human life, this discovery could save the world economy tens of trillions of dollars.

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