

November 10, 2022

Bruce Gordon  
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World Health Organization

RE: Scientists Letter: The World Health Organization Should Significantly Revise or Withdraw Its Draft PFAS Drinking Water Guidelines

Dear Mr. Gordon,

We, the undersigned 116 scientists, who are experts on per- and polyfluoroalkyl substances (PFAS), including health effects and water treatment technologies, are writing to express concerns about the draft "[Background document for development of WHO Guidelines for Drinking-water Quality](#)" for PFOS and PFOA. **We strongly recommend that this document be significantly revised and the numerous peer-reviewed scientific studies demonstrating strong links between PFOS and PFOA exposure and the many adverse health outcomes be carefully considered. Otherwise, the proposed guidance should be withdrawn.**

The proposed WHO guidelines are derived using a seemingly arbitrary technology-based approach (p. 80) and are far less protective than if a scientifically defensible health-based approach were used.<sup>1, 2</sup> The WHO assessment disregards the robust evidence of human health harm at environmentally relevant exposure levels<sup>3, 4, 5</sup> which is also supported by experimental literature.<sup>6</sup> Additionally, the proposed guidelines are much less protective than what can be achieved by the commonly used water treatment technologies identified in the WHO (p. 75) and other<sup>7, 8</sup> reports.

Below are a few examples illustrating how the WHO survey of scientific studies omits or obscures strong evidence of the links between PFOS and PFOA exposure and adverse health outcomes.

- **Carcinogenicity.** The US Environmental Protection Agency (EPA), California EPA, and the US EPA Science Advisory Board (SAB) and its PFAS Review Panel all agree that evidence from animal and human studies (including within the general population) supports development of a drinking water guideline for PFOA based on cancer risk,<sup>9</sup> and WHO's drinking water guidelines for many other contaminants are based on cancer risk. Applying a PFOA cancer slope factor based on human data developed by another authoritative group<sup>10</sup> would result in a drinking water value well below the WHO provisional guideline, making this an important and sensitive endpoint for risk assessment.

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- Liver Damage.** While the draft document acknowledges the consistent association between PFOS and PFOA exposure and increased serum alanine aminotransferase (ALT), it misleadingly determines that the association is “small” and inaccurately concludes that there is “no evidence of liver disease” (p.69). The US EPA SAB report determined that population elevations in ALT are reliably associated with increased disease and mortality from liver disease and from other causes and that ALT should therefore be considered as an endpoint for risk assessment.<sup>9</sup> California EPA is using increased levels of ALT as the basis for their draft non-cancer drinking water value for PFOA.<sup>10</sup> The draft document also ignores that there is parallel, substantial evidence of associations between PFOA exposure and biomarkers of liver disease besides ALT across populations.<sup>11, 12, 13, 14, 15, 16</sup> Additionally, the draft overlooks that “small” perturbations of ALT are predictably associated with larger perturbations in clinically abnormal values in the general population.<sup>17, 18, 19</sup> This can be seen specifically for PFOA, in both cross-sectional and longitudinal studies and at environmentally relevant exposure levels affecting many contaminated communities.<sup>3, 6, 13, 20</sup> The draft further dismisses parallel evidence that PFAS cause increases in biomarkers of liver damage and microscopic changes in liver cells indicative of steatosis (fatty liver) in multiple species of experimental animals, as well as in cultured cells.<sup>3, 6, 21, 22, 23</sup>
- Increased Cholesterol.** The association of PFOS and PFOA exposure with increased total and LDL cholesterol is strongly supported by data from studies of multiple populations using different study designs and is likely causal.<sup>6, 24, 25</sup> California EPA is using human studies of increased cholesterol as the basis for its draft non-cancer drinking water value for PFOS.<sup>10</sup> The WHO analysis omits this evidence and makes an entirely unsupported speculation that documented associations of PFAS and serum lipids may be chalked up to “inter-individual variability” (p.69) despite evidence from populations from around the world and a replicable dose response in large population studies.<sup>26, 27, 28</sup> The wealth of population data linking PFAS exposure is also fully consistent with the histologic findings of steatosis (fatty liver) in studies of laboratory animals and cultured cells, noted above.<sup>3, 6, 21, 22, 23</sup> Further, the draft does not mention associations of PFAS with clinically defined high cholesterol,<sup>29</sup> and leaves readers with the impression that there is no excess cardiovascular morbidity, discounting the obvious lipid medication needs, costs, and side effect profiles associated with treatment of high cholesterol in an ever-increasing number of exposed populations.
- Immune Effects.** The draft contains important misstatements regarding immunotoxicity and the value of the vaccine response in serving as a robust marker of immunotoxicity.<sup>30</sup> The US EPA SAB and its PFAS Review Panel concluded that decreased antibody response to vaccines in humans is a valid endpoint for risk assessment because when “the vaccine response is suppressed, it indicates that some

part of the immune system is not performing at the level that it should.”<sup>9</sup> Therefore, epidemiological studies that report diminishment of the vaccine response with increased levels of PFOA/PFOS exposure, such as those cited in the draft (Sections 4.2.4 and 5.6), reflect robust immunotoxicological outcomes. Additionally, the draft discounts supportive rodent data by stating that immunotoxicity caused by PFAS is accompanied by changes in food consumption and/or weight, yet most of the rodent studies cited in the draft (Section 5.6) indicate diminishment of the antigen-specific antibody response at administered doses that do not induce changes in body weight and/or food consumption.

As summarized above, the current science along with most recently proposed US EPA health advisories<sup>1</sup> and European Commission Scientific Committee on Health, Environmental and Emerging Risks’ opinion<sup>2</sup> provide compelling evidence that exposures to PFOS, PFOA and other PFAS have adverse impacts on human and animal health, even at very low levels.

As the authoritative international body on public health and water quality, WHO should provide health-protective, science-based guidance. **We strongly recommend that WHO issue science-based guidelines supported by a comprehensive review of the scientific literature and commonly used treatment technologies or otherwise withdraw the proposed guidance.** PFOA and PFOS are routinely removed from drinking water to non-detectable levels. Therefore, treatment removal limitations do not prevent the ability to meet health protective drinking water levels.

We share the WHO’s concern about the high cost of PFAS remediation (p. 81). However, **the high cost associated with water treatment measures is not a valid justification for setting less protective drinking water guidelines.** What is urgently needed is for authorities around the globe to work to prevent exposure and establish mechanisms to hold chemical manufacturers financially responsible for the cost of remediation. Although PFAS manufacturers’ own research has documented the health harm of PFAS, they continue selling these chemicals contaminating the drinking water and harming the health of numerous communities worldwide.

Finally, as an authoritative body, **WHO should enforce conflict-of-interest policies, so that those with financial and other conflicts-of-interest are not in advisory, peer-review, or decision-making roles.** We strongly urge WHO to avoid any suggestion of possible lack of objectivity and request that WHO identify the names, affiliations, and potential conflicts-of-interest of those involved in the preparation or peer-review of this draft and any future WHO documents.

Respectfully submitted,

***The views expressed are those of the signatories and do not necessarily represent their affiliated organizations.***

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