

Dechlorane Plus

Further additional information on adverse effects

Prepared for the intersessional working group on Dechlorane Plus
Persistent Organic Pollutants Review Committee

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1. Introduction

1. At its seventeenth meeting the Committee adopted decision POPRC-17/2, by which it adopted the risk profile (UNEP/POPS/POPRC.17/3.Add 2), and concluded that Dechlorane Plus is likely, as a result of its long-range environmental transport, to lead to significant adverse human health and/or environmental effects such that global action is warranted. The Committee also decided to establish an intersessional working group to prepare a risk management evaluation that included an analysis of possible control measures for Dechlorane Plus in accordance with Annex F to the Convention. Parties and observers were invited to submit to the Secretariat, before 14 March 2022, the information specified in Annex F as well as additional information relating to adverse effects of Dechlorane Plus. Recognizing that the dataset on toxicity and ecotoxicity is limited, but that available short-term toxicity data indicates concern for potential adverse effects to the environment and humans at low levels, the Committee also invited the intersessional working group to explore any further information on adverse effects, and, if appropriate, to revise the risk profile for consideration by the Committee at its eighteenth meeting.

2. In accordance with Decision POPRC-17/2 this document presents new information on adverse effects of Dechlorane Plus that has become available since the Committee's seventeenth meeting and includes information submitted by Parties and Observers as well as information openly available information retrieved from peer-reviewed scientific literature.

3. The additional information on adverse effects is envisaged as an addendum to the risk profile adopted at POPRC-17 contained in document UNEP/POPS/POPRC.17/3.Add 2.

2. Response to call for information

4. Information on adverse effects was submitted by the following Parties and Observers: Republic of Korea, Saudi Arabia and the UK. All submissions are available on the Convention web site.

3. New information on adverse effects

5. During the period between the POPRC 17 in January 2022 and May 2022, two peer-reviewed studies have become available, and they are summarized below. One study is a field study considering impact of DP and other contaminants on fatty acid composition in seals. The other study is an epidemiology study investigating relationship between serum DP concentration, body mass index and how human serum albumin binding of ethanol or free-fatty acids in the blood can explain some of the differences observed in serum levels of DP between normal weight and obese people, and alcoholic and non-alcoholic people.

3.1 Ecotoxicity

6. In a field study of seals from Northern Atlantic the relationship between hepatic fatty acids (FA) profiles and exposure to a suite of contaminants in a sentinel species, the harbor seal (*Phoca vitulina*), from the Gulf of Maine and the south coast of Sweden were investigated. FA profiles differed in the two seal populations, and the levels of legacy and alternative brominated flame retardants and polyhalogenated carbazoles were significantly elevated in Maine seals. The results suggest that the potential of contaminants to disrupt lipid metabolism in marine mammals warrant continuous biomonitoring and risk assessment, considering the critical role of poly-unsaturated FAs in vital biological processes. Detection frequencies of *syn*- and *anti*-DP was 28% and 68% respectively in the Swedish seals, and 20% and 30% respectively, in the seals from Main. The concentrations of sum perfluoroalkyl carboxylates (Σ PFCAs), polybrominated biphenyls (Σ PBDEs), alternative brominated flame retardants (Σ aBFRs), and dechloranes (Σ DECs) were all correlated with ratio of sum 6 and 3 (Σ n-6/ Σ n-3) poly-unsaturated FAs (PUFAs) in Swedish seals. Significant positive relationship between some of hepatic FA ratios (Sn-6/n-2nPUFA, 16:1n7/16:0) and Σ DECs were observed in the seals from Sweden (Sun et al., 2022).

3.2 Human health

7. In an epidemiology study, serum was sampled from the same participants (n=33) in five consecutive years (2012-2016) from the general population of Wuxi City, Jiangsu Province, China (Bao et al., 2022). No temporal trend was observed over the period, sum DP in serum were in the range of 1.73-16.21 ng/g lw (mean 4.67 ng/g lw). Differences between DP concentrations in serum from overweight people (BMI \geq 24.0) and normal weight people and between DP concentrations in serum from alcoholic and non-alcoholic people were investigated. Furthermore, it was explored if fatty acids and ethanol could have any influence on the DP concentrations in human serum. *Syn*-DP

concentration was significantly higher in serum from overweight people (1.11 ± 0.57 ng/g lw) than from people with normal BMI (0.65 ± 0.54 ng/g lw). The *syn*-DP and *anti*-DP concentrations were significantly lower, ($p = 0.046$ and 0.002 , respectively), in serum from alcoholic people (0.63 ± 0.40 and 3.46 ± 1.23 ng/lw, respectively) than in serum from non-alcoholic people (0.81 ± 0.65 and 4.28 ± 2.13 ng/lw, respectively). These results might be explained by the affinity and binding-seats in human serum albumin (HAS), where *anti*-DP had higher affinity than *syn*-DP. The affinity between DP and HSA was also shown to increase as the amounts of fatty acids combined with HAS was increased. This could explain the *syn*-DP and *anti*-DP concentrations in serum being higher for overweight people than for normal weight people. Ethanol was shown to occupy the DP binding sites on HAS which might explain that *syn*-DP and *anti*-DP concentrations being lower for alcoholic people than for non-alcoholic people (Bao et al., 2022).

References

Bao J, Hou L, Wang Y, Zhang Y, Qiao J, Su M, Jin J, Chen L (2022). Effect of Affinity between Dechlorane Plus and Human Serum Albumin on Its Serum Concentration in a General Population. *Environ. Sci. Technol.* 56 (4), 2511–2518 <https://doi.org/10.1021/acs.est.1c07525>

Sun J, Zhang L, Zhou F, Shaw S, Roos A, Berger M, Bäcklin B-M, Huang Y, Zheng X, Wang X, Chen D (2022). Hepatic Fatty Acid Profiles Associated with Exposure to Emerging and Legacy Halogenated Contaminants in Two Harbor Seal. *Environ. Sci. Technol.* 56, 1830–1840. <https://doi.org/10.1021/acs.est.1c06512>