

Science Project: Environmental Risk Evaluation Report: Decamethylcyclopentasiloxane Summary

The Environment Agency and collaborators have evaluated the environmental risk of decamethylcyclopentasiloxane, also known as D5. Under our chemical prioritisation system, D5 is one of a group of related cyclic siloxanes identified as a high priority for the evaluation of risks to the environment.

The evaluation follows closely the methods outlined in the European Union (EU) Technical Guidance Document (TGD) for the risk assessment of new and existing chemicals. The producers and users of D5 provided some of the information used in the report on a voluntary basis, and their helpful assistance is formally acknowledged. The evaluation has also been through a national and international peer review process.

The main uses of D5 are as an intermediate in the production of other chemicals (silicone polymers), as a component in some personal care products (such as cosmetic products and skin- and hair-care products), in some household cleaning products, and in some types of industrial/institutional cleaning. Use as an intermediate to make silicone polymers effectively consumes the D5, although trace amounts still remain in the final products and can subsequently be released to the environment during polymer use. D5 in personal care and household products results in widespread environmental exposure.

The persistent, bioaccumulative, and toxic (PBT) status of D5 is assessed using the available measured and calculated data. The overall conclusions for the PBT assessment are:

1. D5 meets the screening criteria for very persistent and very bioaccumulative (vPvB) substances, but some mitigating factors and uncertainties need to be considered further. In particular, the substance is expected to be lost from water by volatilisation to the air, where subsequent degradation occurs.
2. The current criteria for persistence are related to degradation half-lives in an individual compartment

(aquatic, sediment, etc.). These may not be the most appropriate for a substance such as D5 which is likely to be removed from the aquatic compartment more rapidly by physical processes than by degradation. This indicates a need to consider the overall persistence of the substance, including the potential for transport over distances and the effects at remote locations. At present there are no criteria for such considerations, and this therefore requires both further scientific discussion and consideration at a policy level.

3. There are uncertainties over the long-term toxicity of the substance to fish. The available data suggest that D5 shows no adverse effects at concentrations up to its water solubility. However, the available long-term fish toxicity data may not cover all the relevant toxicological endpoints. Further long-term toxicity testing with fish would be useful to reduce these uncertainties but, given that D5 is already considered to be a potential vPvB substance, the actual need for such a test at present is unclear.

Standard models are applied to the information available to assess the risks from the normal use of D5 to water, sediments, soil, and predators. The property data set is reasonably complete, but in some areas further information could be valuable. This assessment therefore makes recommendations about the significance of the data gaps and/or data uncertainties, and suggests where further research should be focussed.

Estimates of potential emissions to the environment from the key life-cycle stages are based on industry research, Emission Scenario Documents, and (in the absence of any other information) worst-case default assumptions. Monitoring data are available for some life-cycle stages and are taken into account in the assessment where relevant. Using the available information, risk characterisation ratios above one, which indicate an unacceptable risk for the environment, are identified for some life-cycle stages

relevant to the UK for freshwater and marine sediments. No risks from the production and all uses of D5 in the UK are identified for the air, water, and terrestrial compartments or for predators. The risks to humans exposed to D5 via the environment are assessed. The resulting margins of safety are large enough to conclude that there are no concerns for local or regional exposures.

The main findings of the risk evaluation are:

1. No risks are identified from the production and all uses of D5 for the air, water, and the terrestrial compartments, nor for humans exposed via the environment.
2. No risk is identified for predators from the production and all uses of D5 in the UK. Two scenarios related to the life-cycle stage formulation of personal care products at sites outside the EU lead to risk characterisation ratios >1 for freshwater predators, but are not relevant to the UK. It is likely that these scenarios could be further refined by obtaining more exposure information if desired.
3. Uncertainties associated with the assessment for predators relate to the biomagnification factors and the predicted no-effect concentrations used. Little guidance is currently available on the best ways to interpret the specific data used in this assessment. In addition, it is not currently possible to assess fully the risks to predators through the consumption of earthworms, although the available evidence suggests that exposure via this route does not lead to a risk.
4. Risks are identified for freshwater sediments from the life-cycle stages production and on-site use as an intermediate, some personal care formulation sites, use of personal care products by the general public, and regional sources of D5. In addition, risks are identified for marine sediments from production, on-site use as an intermediate, some personal care formulation sites, use of personal care products by the general public, and regional sources. These life-cycle stages are relevant to the UK and are based on the best information available. There are data gaps, and where these occur estimates are made, which inevitably increase the uncertainty in any risk identified and conclusion drawn.
5. In light of the risks identified for sediment, to further refine the predicted environmental concentrations (PECs) for this endpoint, it is recommended that further exposure information be obtained for production sites and in relation to the formulation and use of personal care products in the UK. This could take the form of statistically analysed site-specific data on emissions, in compliance with the TGD (e.g. further monitoring of effluent or of the receiving water).
6. Subject to any revisions of the PECs for sediment that may result from the provision of the

information outlined above, further testing may be required, such as a long-term toxicity test with *Hyalella azteca* (or similar) using spiked sediment.

Any further sediment-toxicity testing should take account of the recommendation in the TGD that such tests be carried out without supplemental feeding.

Industry is currently undertaking a voluntary test programme to address some of the uncertainties in this assessment.

This Summary relates to information from the following science project:

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