EUROPEAN COMMISSION

Health & Consumer Protection
Directorate-General

Scientific Committee on Health and Environmental Risks

SCHER

4-methyl-m-phenylenediamine

Environmental Part

CAS Number: 95-80-7
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Scientific Committees
on consumer products
on emerging and newly identified health risks
on health and environmental risks

Opinion adopted by the SCHER during the 23rd plenary of 6 May 2008

About the Scientific Committees

Three independent non-food Scientific Committees provide the Commission with the scientific advice it needs when preparing policy and proposals relating to consumer safety, public health and the environment. The Committees also draw the Commission's attention to the new or emerging problems which may pose an actual or potential threat.

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1. BACKGROUND

Council Regulation 793/93 provides the framework for the evaluation and control of the risk of existing substances. Member States prepare Risk Assessment Reports on priority substances. The Reports are then examined by the Technical Committee under the Regulation and, when appropriate, the Commission invites the Scientific Committee on Health and Environmental Risks (SCHER) to give its opinion.

2. TERMS OF REFERENCE

The SCHER on the basis of the examination of the Risk Assessment Report is invited to examine the following issues:

1. Does the SCHER find the conclusions of the targeted risk assessment appropriate?
2. If the SCHER finds any conclusion not appropriate, the SCHER is invited to elaborate on the reasons for this divergence of opinion.
3. If the SCHER finds any specific approaches or methods used to assess the risks inappropriate, the SCHER is invited to suggest possible alternative approaches or methods meeting the same objectives.

3. OPINION

3.1 General Comments

The environmental part of the risk assessment of 4-methyl-m-phenylenediamine (toluene-2,4-diamine, 2,4-TDA) is in general of good quality. It uses properly the available information and presents justifications for the assumptions and decisions adopted in the RAR. However, the information supporting the site-specific assessment is not sufficiently detailed; therefore, the SCHER cannot comment on the appropriateness of the PECs and PEC/PNECs presented in the report.

The PEC/PNEC ratios for wastewater treatment plants, surface water and sediment for one site within the scenario "processing of 2,4-TDA to dyes" (at site dye 1) are higher than 1. These estimations are fully based on default values. The SCHER welcomes the proposed approach leading to conclusion i)[1], which is expected to generate an improved assessment of the exposure information.

Regarding secondary poisoning the committee supports the decision of low bioaccumulation potential; and taking into account the toxicokinetic information showing rapid metabolisms in mammals, considers that secondary poisoning is of low relevance.

3.2 Specific Comments

3.2.1 Exposure assessment

2,4-TDA is a clear colourless solid (at room temperature and normal pressure) with an aromatic odour , classified as category 2 carcinogen (R45), mutagenic cat.3 and reprotoxic cat.3 (R68, R62), dangerous for the environment (N) and toxic to aquatic organisms, that may cause long-term adverse effects in the aquatic environment (R51/53).

2,4-TDA is produced and imported in EU. The RAR presents an estimated production volume of 280,000 t/a (year 1999-2000). Additionally, about 10,000 t/a are imported. As no

[1] *According to the Technical Guidance Document on Risk Assessment – European Communities 2003:*

- conclusion i): There is a need for further information and/or testing;
- conclusion ii): There is at present no need for further information and/or testing and for risk reduction measures beyond those which are being applied already;
- conclusion iii): There is a need for limiting the risks; risk reduction measures which are already being applied shall be taken into account.

information is available about export volumes, the total volume of 2,4-TDA handled in EU amounts to 290,000 t/a.

In the EU 2,4-TDA is almost exclusively used as intermediate in the chemical industry to produce modified or unmodified toluylene diisocyanates (TDI) which are found in flexible foams for upholstery within the furniture and automobile industry (83%), non-foam applications e.g. cast and thermoplastic elastomers, microcellular polyurethanes, coatings, sealants, adhesives, resins, millable gums and fibres (14%) rigid foams (1.5%) and semirigid foams for dashboards and head restraints within the automobile industry. The processing of 2,4-TDA to diethyltoluylendiamine (DETDA), now stopped in the EU, and leather dyes has been reported. Further processing of 2,4-TDA leads to polyols and various azo dyes. The RAR reports that more than 99% of the produced and imported TDA is used as an intermediate for the production of TDI, while the pure TDA is used for the production of dyes by the chemical industry.

Diffuse release can occur from TDA or TDI (after hydrolysis) chemically reacted in polyurethane or epoxy matrices during uses and disposal of polymer products.

Different tests showed that 2,4-TDA is not readily biodegradable. 2,4-TDA (and the isomer 2,6-TDA) are only biodegradable by adapted inocula, e.g. industrial sewage sludge. The biodegradation rate constant of 0.1 h^{-1} for 2,4-TDA has been derived according to TGD for industrial sewage treatments plants. Results from biodegradation simulation tests in surface water are not available. Therefore, the rate constants have been determined according to the TGD. As 2,4-TDA is not biodegradable by non adapted microorganisms, a constant of 0 d^{-1} for both isomers has been assumed for this compartment.

For the exposure assessment, degradation by direct photolysis is not considered. Based on the molecular structure, hydrolysis is not expected under environmental conditions.

Microbial degradation in soil has been studied in both aerobic and anaerobic conditions. The tests under aerobic conditions indicate biodegradation of 14.8% (2,4-TDA) and 18.1% (2,6-TDA) after 56 days. The longer term data, i.e. at 210 and 365 days respectively, are not to be considered acceptable, due to losses of radiolabeled carbon dioxide during the assay. Under anaerobic denitrifying conditions 1% of $^{14}CO_2$ was produced from radiolabeled 2,4/2,6-TDA. There are no data available on biodegradation of TDA in sediments. Therefore, according to TGD, a half-life of 10,000 d is assumed for this compartment.

For the photochemical-oxidative degradation in the atmosphere, a half-life of 2h (2,4-TDA) and $\leq$ 3.8 h (2,6-TDA) has been calculated.

The SCHER agrees on the default PEC estimates (according to TGD), the site-specific assessment is based on information not included in the RAR and not available to the committee. Thus, the SCHER cannot produce an opinion on these estimations.

As for terrestrial compartment, neither direct nor indirect releases into the soil are expected to occur in significant amounts. The SCHER agrees partially on the assumption that no or only traces amounts of TDA are discharged during deposition of polyurethane wastes on landfills, as the assumption is based on one study dated 1981 and another study where only TDI-based flexible polyurethane foams were tested under simulated methanogenic landfill conditions. Traces of TDA were found initially in the leachate and levels returned to background within 200 d. The study seems to reach only circumstantial experimental evidences, and the SCHER would propose conclusion (i) for terrestrial compartment.

The same applies for non compartment specific exposure relevant to the food chain since, due to missing experimental data on bioaccumulation with sediment dwelling organisms, a quantitative assessment of secondary poisoning via this route cannot be performed for TDA. Nevertheless, the mammalian toxicokinetics confirm a low potential for biomagnification due to rapid metabolism.

The SCHER agrees on the continental and regional PEC for 2,4-TDA, 2,6-TDA and total TDA.

The Committee has concerns on the use of a recalculated Kow based on the Koc in the regional assessment.

3.2.2 Effect assessment

There is a limited amount of information covering short-term and long-term toxicity to fish with TDA and TDA/TDI. The same applies for short- and long-term toxicity to invertebrates and for toxicity to algae. The marine species *Pagrus major* is particularly sensitive to 2,4-TDA (but not to 2,6-TDA). The effects seem to be species-specific and cannot be extrapolated to other marine species. The RAR presents two parallel PNEC estimations. The $PNEC_{aqua1}$, uses an assessment factor of 100 on the acute value on the sensitive species according to the TGD, resulting in 1.6 μg/l. A second PNEC has been derived from a long-term Daphnia study, using an assessment factor of 50, being $PNEC_{aqua2}$ = 5.64 μg/l. It should be noted that both values give similar results in the risk characterization.

Only one test with microorganisms is available for the derivation of $PNEC_{micr}$ 1 mg/l. The committee would prefer a PNEC derived from a larger data set, but recognises that the derivation follows the TGD recommendations.

The PNEC for sediment and for soil are derived from toxicity data. Due to limitations in data availability, the SCHER considers that in addition to the estimations presented in the RAR, the equilibrium partitioning method should be included for the soil compartment.

For non compartment specific effects relevant to the food chain, according to TGD it is assumed that the available mammalian toxicity data with laboratory animals can provide an indication on the possible risks of this toxic chemical to top-predators in the environment. From a 2-years study with rats exposed to 2,4-TDA via food, a $PNEC_{oral}$ of 1.97 mg/kg food has been calculated based on a LOAEL from a 2-years study on rats, applying a factor of 60 (30 for a chronic study, and 2 for moving from the LOAEL to the NOAEL). The endpoints are not included in the environmental part of the RAR, but looking into the human health part, they include reduced survival rate and reduced body weight gain; and therefore are considered ecologically relevant. Being 2,4-TDA a recognised genotoxic carcinogen, the RAR considers that the chemical may affect individuals of top-predators of species with long life-cycles at concentrations below the $PNEC_{oral}$.

Nevertheless, from and ecological perspective the protection aims should be established at the population/community level. The RAR suggests that particularly for endangered species where individuals may need to be protected to support the species, a potential risk should be considered.

The SCHER understands that this approach might be appropriate for the site-specific local assessment. However this is not standard practice, and the follow up of the rationale presented in the RAR, would require a site-specific analysis, which in fact is not included in the report. The rationale for not presenting this assessment is that the risk is covered by the human health assessment. Again this statement might be accepted, but adapting the exposure assessment to the assessed species. In this case and for consistency the proposed conclusion should be similar to that presented for humans exposed through the environment. Thus, the SCHER considers that the secondary poisoning assessment should be carried out following the general practice of the protection of populations/communities, avoiding non-developed interpretations of the potential ecological relevance of the genotoxic carcinogenicity of the substance.

3.2.3 Risk characterisation

The SCHER agrees with the proposed conclusion (i) for the site dye 1 that processes 2,4-TDA to dyes. Indeed, the PEC-PNEC rations for wastewater treatment plant, surface water and sediment are above 1 for the scenario "processing 2,4-TDA to dyes" at site dye 1. As the scenario is fully based on default values, an improvement of exposure data should be possible. Information on TDA emission from the production of dyes at this site should also be provided. The SCHER notices that an effect refinement is also possible for all compartments and in particular for the $PNEC_{microorganisms.}$ Thus, if required, additional toxicity tests should be considered within the refinement process.

The SCHER agrees with the proposed conclusion (ii) for the aquatic compartment and for wastewater treatment plants for all other sites and the environmental compartment atmosphere, soil, and secondary poisoning.

4. LIST OF ABBREVIATIONS

DETDA	Diethyltoluylendiamine
LOAEL	Lowest Observed Adverse Effect Level
NOAEL	No Observable Adverse Effect Level
PEC	Predicted environmental concentration
PNEC	Predicted no effect concentration
QSAR	Quantitative Structure-Activity Relationship
RAR	Risk Assessment Report
TDI	Toluylene diisocyanates
TGD	Technical Guidance Document