Miljøministeriet
Miljøstyrelsen

Fastsættelse af kvalitetskriterier for vandmiljøet

EP2 syre
CAS nr. 2465-65-8

Vandkvalitetskriterium	$VKK_{ferskvand}$	Ikke muligt
Vandkvalitetskriterium	$VKK_{saltvand}$	Ikke muligt
Korttidsvandkvalitetskriterium	$KVKK_{ferskvand}$	Ikke muligt
Korttidsvandkvalitetskriterium	$KVKK_{saltvand}$	Ikke muligt
Sedimentkvalitetskriterium	$SKK_{ferskvand}$	Ikke relevant
Sedimentkvalitetskriterium	$SKK_{saltvand}$	Ikke relevant
Biota-kvalitetskriterium, sekundær forgiftning	$BKK_{sek\ forgiftn.}$	Ikke relevant
Biota-kvalitetskriterium, sundhed	$BKK_{sundhed}$	Ikke relevant

9 November 2021

Indholdsfortegnelse

Forord

Et kvalitetskriterium i vandmiljøet er det højeste koncentrationsniveau, ved hvilket der skønnes, at der ikke vil forekomme uacceptable negative effekter på vandøkosystemer.

Miljøstyrelsen (MST) udarbejder kvalitetskriterier for kemikalier i vandsøjlen (vandkvalitetskriterium), i sediment og i dyr og planter (biota).

Miljøstyrelsen bruger kvalitetskriterierne som det faglige grundlag til at kunne fastsætte miljøkvalitetskrav, hvorved der forstås den endelige koncentration af et bestemt forurenende stof i vand, sediment eller biota, som ikke må overskrides af hensyn til beskyttelsen af miljøet og menneskers sundhed.

Metodikken, der anvendes til udarbejdelse af miljøkvalitetskrav er harmoniseret i EU og baserer sig på vandrammedirektivet (EU, 2000), EU's vejledning til fastsættelse af kvalitetskriterier i vandmiljøet (EU, 2018) og Miljøstyrelsens vejledning til fastsættelse af vandkvalitetskriterier (Miljøstyrelsen, 2004). Metodikken er endvidere i overensstemmelse med EU's vejledning til risikovurdering under REACH forordningen (EU, 2008).

Miljøstyrelsen har haft mulighed for at kommentere et udkast til databladet inden den endelige udgave. Kommentarerne findes her: link

Den sidste litteratursøgning er foretaget den 07.09.2020.

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English Summary and conclusions

This review is based on validated data from the e-CHEM portal and QSAR data due to lacking available data.

Based on these data sources we discerned the following conclusions in light of the EU TDG (EU, 2018) for EP2 acid (O,O-Diethyl phosphorothionate):

$AA\text{-}QS_{freshwater}$ = Not assessable

$AA\text{-}EQS_{saltwater}$ = Not assessable

$QS\text{-}MAC_{salt\text{- and freshwater}}$ = Not assessable

$QS_{sediment,\ freshwater}$ = Not relevant

$QS_{sediment,\ saltwarer}$ = Not relevant

$QS_{biota\ secondary\ poisoning}$ = Not relevant

$QS_{biota\ human\ health}$ = Not relevant

EP2 acid has the following hazard notification: Acute Tox. 4; H302 (Harmful if swallowed) and Skin Corr. 1; H314 (Causes severe skin burns and eye damage).

1 Indledning

Identiteten af EP2 syre fremgår af tabel 1.1.

Tabel 1.1. Identitet af EP2 syre

IUPAC navn	O,O-Diethyl phosphorothionate
Strukturformel	
CAS nr.	2465-65-8
EINECS nr.	NA
Kemisk formel	$C_4H_{11}O_3P_1S_1$
SMILES	O=P(S)(OCC)OCC

Stoffet er et nedbrydningsprodukt af organofosfat insekticidet disulfoton (Gälli et al., 1994). Der er ingen produktions- eller forbrugsdata for EP2 syre i Danmark (http://www.spin2000.net).

2 Fysisk kemiske egenskaber

De fysisk kemiske egenskaber for EP2 syre fremgår af tabel 2.1 er alle estimeret med QSAR.

Tabel 2.1. Estimeret fysisk kemiske egenskaber for EP2 syre.

Parameter	**Værdi**	**Reference**
Molekylevægt, M_w (g·mol^{-1})	170,16	USEPA, 2020
Smeltepunkt, T_m (ºC)	-3,69	USEPA, 2020
Kogepunkt, T_b (ºC)	209	USEPA, 2020
Damptryk, P_v (Pa [1])	5,85	EPI Suite, 2020*
Henry's konstant, H, (Pa·m^3·mol^{-1})	1,10^{-7}	USEPA, 2020
Vandopløselighed, S_w, (g·L^{-1})	22	EPI Suite, 2020*
Dissociationskonstant, pK_a	NA	NA
Octanol/vand fordelingskoefficient, log K_{ow}	0,853	USEPA, 2020
Log K_{oc} (L·kg^{-1})	1,254[2]	EPI Suite, 2020* (MCI metoden – (Molecular connectivity indices))

[1] Ved 20 ºC

[2] Vi benytter MCI metoden og data da denne vurderes mere videnskabelig valid end en værdi på 82,1 L/Kg fra USEPA 2020 da den er et resultat af stoffets struktur.

*Se bilag B.

3 Skæbne i miljøet

3.1 Nedbrydelighed

Der er ingen eksperimentelle data på nedbrydelighed. En QSAR BIOWIN analyse i EPI Suite (Estimation Programme Interface) viser, at stoffet ikke er let bionedbrydeligt (se bilag B).

3.2 Bioakkumulering

Stoffet har en lav estimeret log K_{ow} værdi på 0,853 og forventes derfor ikke at bioakkumulere. BCF er beregnet til 3,162 L/kg vådvægt (Log BCF = 0,5) (EPI Suite), og det konkluderes derfor, at bioakkumuleringspotentialet for EP2 syre i akvatiske organismer er lavt (se bilag B).

3.3 Naturlig forekomst

EP2 syre er ikke naturligt forekommende.

4 Giftighedsdata

4.1 Giftighed over for vandlevende organismer

Der er kun ét eksperimentelt studie på stoffets giftighed over for vandlevende organismer. Der er ingen registrering af stoffet hos ECHA. I SciFinder gav en søgning på stoffet kun en reference med søgekombinationen: CAS#2465-65-8; toxicity; water. Der er ingen data på stoffet i databaserne US EPA OPP eller EcoTox. Gälli et al. (1994) bestemte en akut toksicitet over for invertebraten *Daphnia magna,* hvor studiet blev udført efter OECD 202 testmetode med varighed på 24 timer og bestemte en EC_{50} værdi på 42,5 mg/L. De bestemte også ved Microtox™ test en væksthæmmende effektkoncentration, EC_{50}, for den marine bakterie *Photobacterium phosphoreum* på 19,0 mg/L – samlet nedenfor:

Art / test guideline	**Effekt konc. (mg/L)**	**Eksponeringstid**	**Effektmål**	**Klimish score**
Akut test:				
Invertebrat *(Daphnia magna)* (OECD 202)	42,5 (LC_{50})	24 t	Overlevelse	2
MicroTox (*Photobacterium phosphoreum)*	19,0 (EC_{50})	15 min	Vækstrate	2

EPI Suite QSAR estimater for EP2 syre har givet følgende resultater (bilag B):

Fisk (kronisk 3 uger) = 0,013 mg/L;

dafnie (akut 48 timer) = 0,026 mg/L;

grøn alge (kronisk) = 648,9 mg/L.

4.2 Giftighed over for sedimentlevende organismer

Der er ingen data for sedimentlevende organismer.

4.3 Giftighed over for pattedyr og fugle

Der foreligger ingen data for pattedyr og fugle.

4.4 Giftighed over for mennesker

Der er ingen giftighedsdata over for mennesker. LD_{50} vurderes til 200 til 2000 mg/kg (SDS, 1984).

5 Andre effekter

EP2 syre har følgende klassificeringer: Acute Tox. 4. (H301: Farlig ved indtagelse) og Skin Corr. 1 (H314: Forårsager svære ætsninger af huden og øjenskader), stoffet er selvklassificeret (SDS, 1984).

6 Udledning af vandkvalitetskriterium

6.1 Vandkvalitetskriterium (VKK)

Der er eksperimentelle data for ét trofisk niveau (invertebrat). Derfor er der ikke nok tilgængeligt data til at fastsætte et vandkvalitetskriterium, da der skal være eksperimentelle data for mindst tre arter repræsenterende tre trofiske niveauer (alge, invertebrat og fisk) ifølge det tekniske guidedance-dokument (TGD#27) (EU, 2018). Da datamaterialet er begrænset, benyttes det eneste brugbare målte data punkt fra Gälli et al. (1994) for akut toksicitet over for *D. magna* på 42,5 mg/L. På grund af det begrænsende datamateriale benyttes en assessment factor (AF eller usikkerhedsfaktor) på 1000 og da bliver:

Ferskvands VKK = 42,5 mg/L/1000 = 42,5 µg/L.

Saltvands VKK beregnes fra det samme studie ved en AF på 10000:

Saltvands VKK = 42,5 mg/L/10000 = 4,25 µg/L

Der skal foreligge eksperimentelle data på mindst tre arter repræsenterende tre trofiske niveauer (alge, invertebrat og fisk) for at VKK kan fastsættes iflg. EU TDG (2018) hvorfor disse værdier blot er til orientering ud fra det ene valide data punkt der findes.

6.2 Korttidsvandkvalitetskriterium (KVKK)

Siden der kun er data fra ét brugbart studie bliver beregningen:

$KVKK_{ferskvand}$ = 42,5 mg/L /100 = 0,425 mg/L = 425 µg/L

Til saltvand benyttes yderligere usikkerhedsfaktor på 10 så beregningen bliver:

$KVKK_{saltvand}$ er lig 42,5 mg/L/100/10 = 42,5 µg/L

Der skal foreligge eksperimentelle data på mindst tre arter repræsenterende tre trofiske niveauer (alge, invertebrat og fisk) for at KVKK kan fastsættes iflg. EU TDG#27 (2018), hvorfor disse værdier blot er til orientering ud fra det ene valide data punkt, der findes.

6.3 Kvalitetskriterium for sediment (SKK)

Da log K_{oc} er mindre end 3 for EP2 syre (Log K_{oc} = 1,254), skal der ifølge TDG#27 (EU, 2018) ikke beregnes et SKK for EP2 syre.

6.4 Kvalitetskriterium for biota (BKK)

Der skal ifølge TGD#27 (EU, 2018) ikke beregnes en BKK for EP2 syre, da BCF for EP2 syre blot er 3,162 L/kg og dermed mindre end tærskelværdien på 100 L/kg (EPI Suite, 2020).

6.5 Kvalitetskriterium for human konsum af vandlevende organismer (HKK)

Der skal ikke beregnes et HKK for EP2 syre på trods af H302 klassificeringen, da stoffet har en lav log K_{ow} værdi på 0,853 og derfor ikke forventes at bioakkumulere. BCF er beregnet til 3,162 L/kg vådvægt, hvilket er mindre end tærskelværdien på 100 L/kg (Log BCF = 3) er der ingen mistanke om giftighed over for mennesker som følge af konsumption af vandlevende organismer. Dokumentationen er dog mangelfuld.

7 Konklusion

Det har ikke været muligt at fastsætte miljøkvalitetskriterier pga. manglende data for EP2 syre baseret på review af tilgængeligt data, samt den videnskabelige litteratur, og metoder beskrevet i EU TGD (2018);

$VKK_{ferskvand}$ = Ikke muligt

$VKK_{saltvand}$ = Ikke muligt

$KVKK_{ferskvand}$ = Ikke muligt

$KVKK_{saltvand}$ = Ikke muligt

$SKK_{ferskvand}$ = Ikke relevant

$SKK_{saltkvand}$ = Ikke relevant

BKK = Ikke relevant

HKK = Ikke relevant

8 Referencer

EU (2000). Europa-Parlamentets og Rådets Direktiv 2000/60/EF om fastsættelse af en ramme for fællesskabets vandpolitiske foranstaltninger af 23. oktober 2000.

EU (2018). Scientific Committee on Health, Environmental and Emerging Risks SCHEER. Scientific Advice on Guidance Document n°27: Technical Guidance for Deriving Environmental Quality Standards. Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 27. Technical Guidance Document for Deriving Environmental Quality Standards.

Gälli R, Rich HW, Scholtz R. (1994). Toxicity of organophosaphate insecticides and their metabolites to the water flea *Daphnia magna*, the Microtox test and an acetylcholinesterase inhibition test. *Aquatic Toxicology* (30), 259-269.

Miljøstyrelsen (2004). Principper for fastsættelse af vandkvalitetskriterier for stoffer i overfladevand. Vejledning fra Miljøstyrelsen nr. 4, 2004.

SDS (1984). Udgået og gammelt SDS fra Cheminova.

USEPA (2020). https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID9052844#properties

9 Bilag A. Kvalitetsevaluering af data

Evaluated study (full reference):	Gälli R, Rich HW, Scholtz R. 1994. Toxicity of organophosaphate insecticides and their metabolites to the water flea *Daphnia magna*, the Microtox test and an acetylcholinesterase inhibition test. *Aquatic Toxicology* (30), 259-269.
Test substance:	EP2 acid
Evaluated test:	OECD 202
Evaluated test species:	*Daphnia magna*
Evaluated test endpoint(s):	Acute lethality
Evaluator (institution):	Hans Sanderson, Department of Environmental Science, Aarhus University

Relevance of the data

For each question, mark one appropriate answer with x.

Remark: Relevance of a study mainly depends on the scope of the assessment / the regulatory framework, for which the study is evaluated. The following 12 questions should therefore be answered in the context of the overall assessment.

	Yes	No
Is the tested species relevant for the compartment under evaluation?	x	

Example: An aquatic species should be tested to evaluate risks for the aquatic environment.

	Yes	No
Are the tested organisms relevant for the tested compound?	x	

Example: In case of an ERA for an antibiotic, cyanobacteria should be used as test species instead of algae.

	Yes	No
Are the reported endpoints appropriate for the regulatory purpose?	x	

Example: Acute effects on aquatic organisms are not relevant for the environmental risk assessment of human pharmaceuticals.

	Yes	No
Are the reported endpoints appropriate for the investigated effects or the mode of action of the test substance?	x	

Explanation: When a risk assessment is performed for a substance, for which information is available on a specific mode of action that is considered relevant for environmental organisms, studies including endpoints assessing this particular mode of action are most appropriate. For instance, if an API is known to affect reproduction of vertebrates, the endpoints of the fish early life stage test may not be appropriate. Instead, fish tests should include endpoints such as vitellgenin levels, secondary sex characteristics, sex ratio and reproduction depending on the specific mode of action of the substance (OECD 2012).

	Yes	No
Is the effect relevant on a population level?	x	

Explanation: Endpoints of the guideline studies, on which the ERA of human pharmaceuticals is based, are generally population relevant. For non-standard tests, population relevance has to be evaluated on a case by case basis.

	Yes	No
Is the recorded effect statistically significant, biologically relevant and appropriate for the regulatory purpose?	x	

Explanation: In the context of environmental risk assessment, a biologically relevant effect is an effect that is important and meaningful for environmental health (EFSA 2011). In a test system with relatively little control variation, minor changes may be statistically significant without necessarily being biologically relevant. To evaluate risks caused by chronic exposure, NOEC or EC_{10} values are used, while EC_{50} values are not appropriate. For the EC_{10}, it has to be evaluated on a case by case basis, if the effect is within biological variation of the control response. To evaluate risks caused by acute exposure (note that this is only relevant for some terrestrial tests with human pharmaceuticals), EC_{50} values are preferred.

	Yes	No
Are appropriate life-stages studied?	x	

Explanation/example: The tested life stage should be (a) appropriate for the selected test and test design and (b) relevant for the expected effect of the API. For instance, fish early life stages are not appropriate for studying effects on reproduction.

	Yes	No
Are the test conditions appropriate for the tested species and relevant for the assessment?	x	

Explanation/example: Test organisms should be tested under appropriate conditions. For instance, freshwater species should be tested in freshwater, and saltwater species in saltwater. If a test with freshwater or saltwater species is required depends on the scope of the assessment.

	Yes	No
Is the timing and duration of exposure relevant and appropriate for the studied endpoints and species?	x	

Explanation: The required exposure time should be appropriate for the test organism and the studied endpoint. Chronic studies should include sensitive life stages or cover the whole life cycle.

	Yes	No
If recovery is studied, is this relevant for the framework for which the study is evaluated?		x

Explanation: In most regulatory frameworks (including the environmental risk assessment of human pharmaceuticals), recovery is not relevant (exception: authorisation of plant protection products).

	Yes	No

Is the substance tested representative and relevant for the substance being assessed?	x	

Explanation: Sufficient information should be provided to allow a clear identification of the test item. A substance may be tested as pure active substance or in a formulation. Tests performed with formulations are relevant for plant protection products, but less relevant within many other regulatory frameworks. Studies with mixtures of different substances are relevant for assessing toxicity of these mixtures, but not for assessing the individual substances contained in the mixture. For salts, the counter ion may influence toxicity. For pro-drugs, the active moiety and, if entering the environment in >10% of the administered does, the pro-drug need to be assessed (EMA/CHMP 2011). Depending on the regulatory framework, effects of transformation products may need to be considered. If the substance causing the effect is not the substance being assessed, expert judgement is needed to decide on how to deal with the results of the study and the resulting risk assessment.

	Yes	No
Is the tested exposure route relevant for the assessment?	x	

Explanation/example: The exposure route should be appropriate for the assessment. For instance, exposure by injection is generally not appropriate (Harris et al. 2014). For pharmaceuticals, exposure should be continuous. Intermittent exposure is generally not relevant. Exposure duration has to be sufficiently long. However, note that acute tests with some terrestrial organisms are also required in the environmental risk assessment of human pharmaceuticals.

Assigned relevance class	1

Reliability of the data

General information

Remark: Before evaluating the test, please check the physico-chemical characteristics of the test substance (what is the solubility, log K_{OW}, pK_a, is the compound volatile, does it hydrolyse, photolyse etc.?)

For each question, mark one appropriate answer with x.

Is a standard method (e.g. OECD, ISO, US EPA) or modified standard used? Please specify:	Yes	No
A standard method is used.	x	

	A slightly modified standard method is used.		**x**
	A substantially modified standard method is used.		**x**
Is the test, including chemical analysis of the test substance where required, performed under GLP conditions?			**x**
Validity criteria:			
		Yes	**No**
a	**Are all validity criteria fulfilled if applicable?**		**x**
	Explanation: For standard tests, compliance with the validity criteria of the guideline is crucial for a study to be considered as reliable. Please check the corresponding test guideline where relevant. For non-guideline tests with standard species, validity criteria as described in a guideline for a similar test should be met if applicable.		
		Yes	**No**
b	**Are validity criteria clearly failed?**		**x**
	Explanation: If validity criteria are clearly failed, a test is classified as '3' (not reliable).		
Inclusion of appropriate controls:			
	Explanation: It depends on the test substance and test type which controls should be included; please check the corresponding test guideline where relevant. In addition to the negative control, a solvent control has to be included in all cases where a solvent is used. The concentration of solvent in the solvent control should correspond to the highest solvent concentration used in the test treatments. In some tests, a positive control with a reference substance is required. For standard tests, the corresponding guidelines provide information on how the controls should perform, e.g. with regard to survival, growth or reproduction. For non-standard tests and non-standard test organisms, expert judgement is needed to decide if performance of the controls is acceptable. Performance of the solvent control should preferably not differ significantly from performance of the negative control.		
		Yes	**No**
a	**Was a negative control included, and was its performance acceptable?**		**x**
b	**Was a positive control included, if required, and was its performance acceptable?**		**x**
c	**Was a solvent control included, if a solvent was used, and was its performance acceptable?**		**x**
Test substance			
		Yes	**No**
Is the test substance clearly identified with name, CAS-number or SMILES code and, where relevant, information on stereochemistry?			**x**
	Explanation/example: If the salt of an API was tested, information on the type of salt should be provided. It should be specified if test concentrations relate to free acid / free base or salt. If the test substance is not clearly identified, a test is classified as '3' (not reliable).		
		Yes	**No**

a	Is the purity of the test substance reported and in an acceptable range (>95%)?		x
b	Is the source of the test substance reported and trustworthy?	na	na
If a formulation is used or if impurities are present:			
		Yes	**No**
a	Can it be excluded that other ingredients in the formulation or impurities exert an effect?		x
b	Is the amount of test substance in the formulation indicated?		x
Test organism			
Description of the test organisms:			
		Yes	**No**
a	Is the test species clearly identified?	x	
	Explanation: If the test species is not clearly identified, a test is classified as '3' (not reliable).		
		Yes	**No**
b	For algae: is mean cell density at the test start within an appropriate range? For other test organisms: Is mean body weight/length of the test organism in an appropriate range?		x
	Explanation for 8 b-e: For standard tests, the corresponding guidelines provide information on required range of mean cell densities, age / life stage of the test organisms etc. at the test start.		
		Yes	**No**
c	Is age/life stage of the organisms at test start reported and in the required range, where appropriate (e.g. not for algae)?		x
d	Is sex of the test organisms reported and is sex ratio appropriate, where relevant (e.g. when evaluating sexual-endocrine effects)?		x
e	Is the species strain reported where required?		x
a	Are the test organisms from a reliable source? For field collected organisms: is the site of origin well-described?		x
b	Have the organisms been acclimatized to test conditions (e.g. water type, temperature) before the start of exposure, where relevant? For tests with embryonic stages: have the parental organisms been held at appropriate conditions?		x
c	Are the test organisms exempt from previous exposure or any other kind of stressor?		x
Test conditions and chemical analysis			
Appropriateness of the experimental system for the test substance:			
		Yes	**No**
Is the type of exposure (e.g. static, semi-static, flow-through) appropriate for the test substance, taking its physico-chemical characteristics into account?		x	

Explanation: Static systems are in most cases only appropriate for short-term tests (exception: water/sediment tests). Where appropriate, guideline requirements should be followed.

	Yes	No
In case that the test substance is a difficult substance as defined in OECD (2000): is the selected test system appropriate for testing of this substance?		x

Explanation: Difficult test substances are substances which are e.g. poorly water soluble, volatile, photo-degradable, hydrolytically unstable, oxidizable, biodegradable, complexing or strongly adsorbing to surfaces of test vessels etc. In order to obtain reliable test results with such substances, test systems generally have to be adapted to take the difficult properties of the substance into account (e.g. by using a closed test system without headspace for volatile substances). For further details, please see OECD (2000). It has to be verified on a case-by-case basis, if the used test system is appropriate for the test substance.

	Yes	No
For ionisable substances: has the test been performed in an appropriate pH-range?		x

Explanation: Relatively small changes in pH can significantly alter the balance between dissociated and non-dissociated forms of some substances. An altered dissociation equilibrium may significantly affect the water solubility and the partition coefficient of the substance and hence, its bioavailability and toxicity. Tests with such substances should therefore be performed at a pH, within the pH range required for maintaining the health of the test organisms, at which the more toxic form of the test substance prevails (as far as possible). For further guidance, see OECD (2000).

	Yes	No
Is the experimental system appropriate for the test organism (e.g. choice of medium / test water or soil, feeding, water or soil characteristics, temperature, light/dark conditions, pH, oxygen content)? Have conditions been stable during the test?	x	

Explanation: The general requirements of the test species should be considered with regard to the characteristics of the selected test medium etc. Temperature, pH and oxygen content should be stable and within the appropriate range for the organism (where applicable, check the corresponding guideline). If control performance is not good (e.g. high mortality), this may indicate that test conditions were not appropriate. Where applicable, feeding should follow the guideline requirements, and all excess should be removed after feeding to avoid decreased bioavailability of the test substance.

		Yes	No
a	**For aquatic tests: were exposure concentrations below the limit of water solubility?**	x	
b	**For aquatic tests: if a solvent was used, was solvent concentration within the appropriate range (i.e. not higher than 0.01%)?**		x
Is a correct spacing between exposure concentrations applied?			x

Explanation: For standard tests, the corresponding guidelines provide information on the spacing factor. A factor of 3.2 is often recommended. As rule of thumb, the spacing factor should not be >10.

	Yes	No
Is the exposure duration defined and appropriate?	x	

Chemical analysis

	Yes	No
Are chemical analyses performed to verify test substance concentrations over the duration of the study where required?		x

Explanation: If required in the corresponding test guideline, nominal test substance concentrations should be verified by chemical analysis. Non-guideline test should be evaluated based on test guidelines for similar tests where appropriate.

	Yes	No
Is an appropriate analytical method used to measure test substance concentrations?		x
Are the measured test substance concentrations within the calibration range of the analytical method?		x
Are samples analysed from a sufficient number of treatments and controls, and from a sufficient number of time intervals?		x

Explanation: The frequency of chemical analyses should be evaluated based on the requirements of the corresponding test guideline or, for non-guideline studies, on a guideline for a similar test if appropriate.

	Yes	No
Are test substance concentrations sufficiently stable during the course of the exposure ?		x

Explanation: Please evaluate according to the requirements of the corresponding test guideline or, for non-guideline studies, a test guideline for a similar test where appropriate.

	Yes	No
Is the biomass loading of the organisms in the test system within an appropriate range?		x

Explanation: For standard tests, the corresponding guidelines provide information on maximum biomass loading. For non-standard tests / non-standard test species, expert knowledge is required to decide if the loading rate is appropriate.

Statistical design

		Yes	No
a	**Is a sufficient number of replicates used for all controls and treatments?**	x	
b	**Is a sufficient number of organisms per replicate used for all controls and test concentrations?**	x	

Explanation for 17 a and b: For standard tests, the guideline requirements should be followed. When a non-guideline study is evaluated, expert judgement is needed to assess if the study design is appropriate to obtain statistically reliable results.

	Yes	No
Are appropriate statistical methods used to derive the effect concentrations?	x	

Explanation: Generally, a description of the statistical methods is needed to assess the reliability of the test results. For standard tests, the corresponding guideline requirements should be followed. Further guidance is e.g. provided by OECD (2006). When a non-guideline study is evaluated, expert judgment may be needed. EC_x values should not be extrapolated considerably beyond the range of tested concentrations.

	Yes	No

a	**Is a concentration-response curve observed?**		**x**

Explanation: The requirement for a concentration-response relationship depends on the objective of the study. If a limit test is performed at one (or two) concentration(s) to verify the lack of toxicity and no toxicity is recorded, a concentration-response relationship is obviously not needed to conclude that the LC_{50} or NOEC is above the highest tested concentration. However, if the intention of the study is to demonstrate an effect, reliability of the test results is higher, if (1) a sufficient number of concentrations have been tested and (2) the observed effect is regularly increasing (or regularly decreasing) with increasing test concentration (i.e. the concentration-response relationship is monotonous). Expert knowledge is needed, if an effect is only observed at the highest tested concentration. Expert knowledge is also needed in the case of non-monotonous concentration-response curves (e.g. U-, J- or inverted U-shaped curves). In such cases, the underlying mechanisms of effects and the reproducibility of the results should be considered (Harris et al. 2014).

		Yes	**No**
b	**Is the observed effect statistically significant?**	**x**	

Explanation: The significance level and the statistical method used to evaluate the specific effect should be indicated.

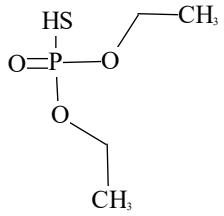
	Yes	**No**
Are sufficient data available to check the calculation of endpoints and (if applicable) fulfilment of the validity criteria (e.g. control data, concentration-response curves)?		**x**

Explanation: If enough data are presented, additional endpoints may be calculated by the assessor if not reported by the author of the study.

Assigned reliability class	**2**

Bilag B. EPISUITE RESULTATER

EPI Suite Results For CAS 2465-65-8



SMILES : O=P(S)(OCC)OCC

CHEM : O,O-Diethyl phosphorothionate

MOL FOR: C4 H11 O3 P1 S1

MOL WT : 170.16

---------- EPI SUMMARY (v4.11) ----------

Physical Property Inputs:

Log Kow (octanol-water): ------

Boiling Point (deg C) : ------

Melting Point (deg C) : ------

Vapor Pressure (mm Hg) : ------

Water Solubility (mg/L): ------

Henry LC (atm-m3/mole) : ------

Log Octanol-Water Partition Coef (SRC):

Log Kow (KOWWIN v1.68 estimate) = 0.48

Boiling Pt, Melting Pt, Vapor Pressure Estimations (MPBPVP v1.43):

Boiling Pt (deg C): 241.03 (Adapted Stein & Brown method)

Melting Pt (deg C): 1.65 (Mean or Weighted MP)

VP(mm Hg,25 deg C): 0.0439 (Mean VP of Antoine & Grain methods)

VP (Pa, 25 deg C) : 5.85 (Mean VP of Antoine & Grain methods)

Water Solubility Estimate from Log Kow (WSKOW v1.42):

Water Solubility at 25 deg C (mg/L): 2.405e+004

log Kow used: 0.48 (estimated)

no-melting pt equation used

Water Sol Estimate from Fragments:

Wat Sol (v1.01 est) = 1.9809e+005 mg/L

ECOSAR Class Program (ECOSAR v1.11):

Class(es) found:

Esters

Esters (phosphate)

Henrys Law Constant (25 deg C) [HENRYWIN v3.20]:

Bond Method : 8.02E-007 atm-m3/mole (8.13E-002 Pa-m3/mole)

Group Method: Incomplete

For Henry LC Comparison Purposes:

User-Entered Henry LC: not entered

Henrys LC [via VP/WSol estimate using User-Entered or Estimated values]:

HLC: 4.087E-007 atm-m3/mole (4.141E-002 Pa-m3/mole)

VP: 0.0439 mm Hg (source: MPBPVP)

WS: 2.41E+004 mg/L (source: WSKOWWIN)

Log Octanol-Air Partition Coefficient (25 deg C) [KOAWIN v1.10]:

Log Kow used: 0.48 (KowWin est)

Log Kaw used: -4.484 (HenryWin est)

Log Koa (KOAWIN v1.10 estimate): 4.964

Log Koa (experimental database): None

Probability of Rapid Biodegradation (BIOWIN v4.10):

Biowin1 (Linear Model) : 0.6665

Biowin2 (Non-Linear Model) : 0.6439

Expert Survey Biodegradation Results:

Biowin3 (Ultimate Survey Model): 2.8231 (weeks)

Biowin4 (Primary Survey Model) : 3.6022 (days-weeks)

MITI Biodegradation Probability:

Biowin5 (MITI Linear Model) : 0.3056

Biowin6 (MITI Non-Linear Model): 0.1841

Anaerobic Biodegradation Probability:

Biowin7 (Anaerobic Linear Model): 0.7289

Ready Biodegradability Prediction: NO

Hydrocarbon Biodegradation (BioHCwin v1.01):

Structure incompatible with current estimation method!

Sorption to aerosols (25 Dec C)[AEROWIN v1.00]:

Vapor pressure (liquid/subcooled): 5.61 Pa (0.0421 mm Hg)

Log Koa (Koawin est): 4.964

Kp (particle/gas partition coef. (m3/ug)):

Mackay model : 5.34E-007

Octanol/air (Koa) model: 2.26E-008

Fraction sorbed to airborne particulates (phi):

Junge-Pankow model   : 1.93E-005

Mackay model   : 4.28E-005

Octanol/air (Koa) model: 1.81E-006

Atmospheric Oxidation (25 deg C) [AopWin v1.92]:

Hydroxyl Radicals Reaction:

OVERALL OH Rate Constant = 38.6286 E-12 cm3/molecule-sec

Half-Life =   0.277 Days (12-hr day; 1.5E6 OH/cm3)

Half-Life =   3.323 Hrs

Ozone Reaction:

No Ozone Reaction Estimation

Fraction sorbed to airborne particulates (phi):

3.1E-005 (Junge-Pankow, Mackay avg)

1.81E-006 (Koa method)

Note: the sorbed fraction may be resistant to atmospheric oxidation

Soil Adsorption Coefficient (KOCWIN v2.00):

Koc   : 17.96 L/kg (MCI method)

Log Koc: 1.254   (MCI method)

Koc   : 19.68 L/kg (Kow method)

Log Koc: 1.294   (Kow method)

Aqueous Base/Acid-Catalyzed Hydrolysis (25 deg C) [HYDROWIN v2.00]:

Rate constants can NOT be estimated for this structure!

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 0.500 (BCF = 3.162 L/kg wet-wt)

Log Biotransformation Half-life (HL) = -1.2884 days (HL = 0.05148 days)

Log BCF Arnot-Gobas method (upper trophic) = 0.044 (BCF = 1.107)

Log BAF Arnot-Gobas method (upper trophic) = 0.044 (BAF = 1.107)

log Kow used: 0.48 (estimated)

Volatilization from Water:

Henry LC: 8.02E-007 atm-m3/mole (estimated by Bond SAR Method)

Half-Life from Model River: 953.6 hours (39.73 days)

Half-Life from Model Lake : 1.051E+004 hours (438 days)

Removal In Wastewater Treatment:

Total removal: 1.90 percent

Total biodegradation: 0.09 percent

Total sludge adsorption: 1.77 percent

Total to Air: 0.05 percent

(using 10000 hr Bio P,A,S)

Level III Fugacity Model:

Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)	
Air	0.751	6.65	1000
Water	36.2	360	1000
Soil	62.9	720	1000
Sediment	0.0936	3.24e+003	0

Persistence Time: 396 hr

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