Practical 1A: Perform a Tier-1 risk assessment for the chemical **Phantasithrin** on basis of the predicted environmental exposure concentrations (PECs) and exposure profile and results of standard laboratory toxicity tests provided below

General Information
Chemical class: Pyrethroid

Mode of action: Primary mode of action is through interference with ion channels in the nerve axon, resulting in hyperactivity of the nervous system with subsequent lack of normal function.   Symptoms of poisoning appear rapidly in all pyrethroids and this is characteristic of this class of compounds.

Use pattern
Phantasithrin is used to as insecticide (to protect crop) and biocide (to kill ticks on cattle).

Environmental Fate Profile
Log Kow: 6.2
Koc: 280 000
Mean Aerobic soil DT50:   20 d
Water solubility: 15 µg/L
Water-sediment half-life (whole system)   38 d
Hydrolytic half life: pH 7 stable, pH 9 DT50 0.5 d

Ecotoxicity Profile

In standard laboratory tests, Phantasithrin is highly acutely and chronically toxic to aquatic Crustacea and Insecta, highly acutely and chronically toxic to fish, but not toxic to aquatic plants. Toxicity data are included in the table below.

Table 1: Tier-1 aquatic toxicity data of Phantasithrin (all GLP studies)

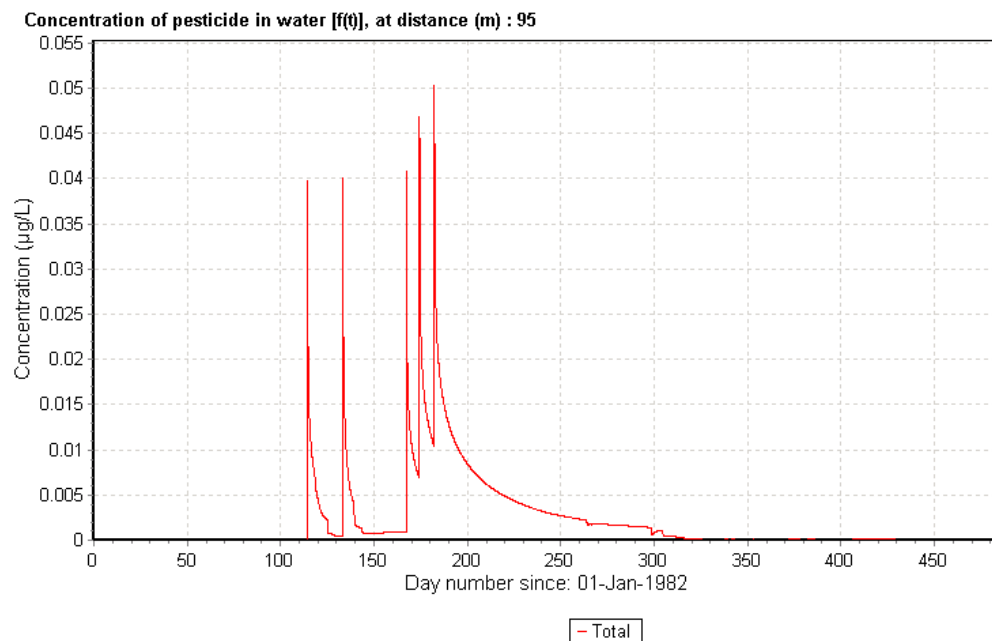| Species	Test duration and type	Toxicity [a] $(\mu g\ ai\ l^{-1})$
Daphnia magna (Crustacea)	48 h flow through	$EC_{50} = 1.2$
Chironomus riparius (Insecta)	48 h static replacement	$EC_{50} = 0.6$
Oncorhynchus mykiss (Fish; rainbow trout)	96 h flow through	$LC_{50} = 15.3$
Selenastrum capricornutum (green alga)	72 h static	$E_rC_{50} > 5000$ NOEC > 5000
Daphnia magna (water flea)	21 d static replacement	NOEC = 0.1 (based on growth)
Chironomus riparius (Insecta)	28 d OECD water-sediment study	$EC_{10} = 0.43$ (emergence)
Pimephales promelas (Fish; fathead minnow)	30 d flow through	NOEC = 1.60

Exposure profile
Modelling revealed the peak exposure concentrations to be expected in surface water is as indicated below.

Table 2: Maximum and 7 d twa PEC surface water values for FOCUS Step 3

Water body	Max PECsw (µg/L)	7 day TWA PEC (ug/L)
Ditch	0.051	0.007
Stream	0.042	0.005
Pond	0.001	0.001

Outputs from the modeling demonstrate that exposure profiles are as indicated below.

Concentration of pesticide in water [f(t)], at distance (m) : 95

Project   : PyrethExSpringCereal   Location   : D1 (Meteo station: Lanna)
RunID   : 00007d_pa   Water body   : Ditch
Substance   : PyrethroidExample   Crop   : Cereals, spring

Question

Based on the information above is there an acute or a chronic risk of Phantasithrin in surface waters?

Practical 1B: Perform a higher-tier risk assessment to address acute risks for the insecticide Phantasithrin on basis of the tier-1 toxicity data (see above) and additional toxicity data presented below and by applying the Species Sensitivity Distribution approach.

All additional toxicity tests were performed in the laboratory at standard test conditions between 16 and 19 ˚C and concerned juvenile life stages, except when indicated otherwise

Species	Taxonomic group	Remark	24-h EC50 µg/L	48-h EC50 µg/L	96-h EC50 µg/L
Hyalella azteca	Crustacea	Species from North America; non GLP		0.045	0.025
Americamysis bahia	Crustacea	Saltwater species; non GLP		0.052	
Gammarus pulex	Crustacea	Size 2.5 mm; non GLP		0.075	
Gammarus pulex	Crustacea	Size 8.0 mm; non GLP		0.146	
Daphnia galeata	Crustacea	Non GLP		< 0.250	
Asellus aquaticus	Crustacea	GLP		0.270	
Ceriodaphnia dubia	Crustacea	GLP	0.780		
Daphnia magna	Crustacea	Non GLP		0.700	
Daphnia magna	Crustacea	Non GLP		0.900	
Cyclops sp.	Crustacea	Non GLP		0.920	
Simocephalus sp.	Crustacea	Non GLP		2.200	
Chaoborus sp.	Insecta	Non GLP		0.049	0.031
Cloeon dipterum	Insecta	GLP		0.120	
Caenis horaria	Insecta	GLP		0.235	
Aedes aegypti	Insecta	Tropical species; tested at 28 ˚C; non GLP		0.240	
Aedes aegypti	Insecta	Tropical species; tested at 18 ˚C; non GLP		0.380	
Ischnura elegans	Insecta	GLP		1.300	
Corixa sp.	Insecta	Non GLP		2.00	
Plea minutissima	Insecta	GLP		3.80	2.30
Polyarthra remata	Rotifera	Non GLP		7.50	
Lymnaea stagnalis	Mollusca	Non GLP		>8.00	
Lumbriculus sp.	Oligochaeta	Non GLP		12.00	
Lepomis macrochirus	Fish	GLP			14.0
Dugesia lugubris	Turbellaria	Non GLP		15.0	
Lemna minor	Macrophytes	GLP		>15.0	

Questions

Which additional toxicity data can be used to construct an acute Species Sensitivity Distribution? Please give motivation.

Based on the Geomean and/or SSD approach, using standard and additional test species, what is the regulatory acceptable concentration? Note the SSD approach can be explored with the ETX program (for information see below).

Considering the available PECs and exposure profile is there still potential risk?

ETX 2.0

This software program calculates a (log) normal distribution through toxicity data entered by the user.

This gives a so called species sensitivity distribution (SSD). This distribution is subsequently tested for statistical criteria on normality. The estimated 5th percentile and median of the calculated distribution are presented, each with their respective two-sided 90% confidence interval. With the calculated SSD the fraction of affected species at a given environmental concentration can be estimated, or an expected ecological risk (EER) at a series of environmental concentrations. The program also offers the opportunity to estimate the 5th percentile of very small data sets using the so called small sample method.

Use of ETX

The techniques offered with ETX are used in risk assessment and in derivation of environmental quality standards (EQS) in the Netherlands and Europe. The techniques are frequently used in the field of ecotoxicology. The purpose of ETX 2.0 is to offer the user the calculation methods as described in the scientific literature. We refer to the manual for an overview of the underlying literature.

In which frameworks is ETX applied?

Setting (inter)national environmental quality standards (INS): standard setting.
Risk assessement in various substances frameworks: risk assessment.

Program and manual

Click to download the program:ETX 2.0
Click to go to the manual: Manual ETX 2.0

The manual of ETX 2.0 describes the installation procedure and the use of the program. The current version also runs under Windows 7. If you have the previous version of ETX 2.0 already installed on your computer, the installation procedure will automatically 'overwrite' this older version. The current version of ETX needs .NET 1.1 for proper functioning, this version will be automatically installed when installing ETX using the setup.exe file.

Citing ETX

The current –Windows 7 compatible- version of ETX can still be cited as ETX 2.0.

Tips, wishes and comments

There is no helpdesk in order to answer questions of users. However, we welcome your comments on the program and its functioning at etx.info@rivm.nl