Robert Luttik

Terrestrial vertebrates
Guidance Document for Birds and Mammals

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National Institute for Public Health and the Environment

Birds and mammals opinion / guidance document

The PPR panel of the EFSA produced an opinion how to assess the risk of plant protection products (181 pages and 32 appendices with ± 550 pages).

This document was not a real a guidance document.

In the course of the revision of the Guidance document it became apparent that the task embraced several risk management issue which are not within EFSA's and the PPR Panel's remit.

The Panel adopted a two stage approach:

1) an opinion with the science behind the guidance document,
2) a joint working group of representatives of the EFSA, the Commission and the Member States that will consider the risk management issues to finalise the new guidance document.

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Birds and mammals opinion / guidance document

- Development of generic focal species
- Acute risk assessment using LD50/m²
- Dietary exposure of nestling birds
- Combined effects of simultaneous exposure to several active substances
- Extrapolated LD50 values from limit dose tests
- Use of the geometric mean rather than lowest endpoint when toxicity data are available from multiple species
- Phase specific approach to avian and mammalian reproductive risk assessment
- Interpretation of protection goals and evaluation of the level of protection

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Indicator species versus focal species

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Choice of indicator and focal species

Indicator species

is not a real species but, by virtue of its size and feeding habits it is considered to have higher exposure than (i.e. to be protective of) other species that occur in the particular crop. It has a high food intake rate, and consumes one type of food which in turn has high residues on/in it.

Used in screening step of risk assessment

e.g. small herbivorous mammal or small insectivorous bird

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Choice of indicator and focal species

Generic focal species

is, again, not a real species, however it is considered to be representative of all those species potentially at risk. It is based on ecological knowledge of a range of species that could be at risk. It may consume a mixed diet rather than just one as for the indicator species. However it is not tried to mimic the diet as good as possible.

Used in first tier assessment

e.g. small granivorous bird (finch)

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Choice of indicator and focal species

Focal species

is a real species that actually occurs in the crop when the pesticide is being used. The aim of using a ‘focal species’ is to add realism to the risk assessment.

Could be used in higher tier assessment

e.g. the Robin

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Choice of indicator and focal species

Plant material is eaten by voles and voles are found all over Europe, but not each vole species can be found in the whole of Europe.

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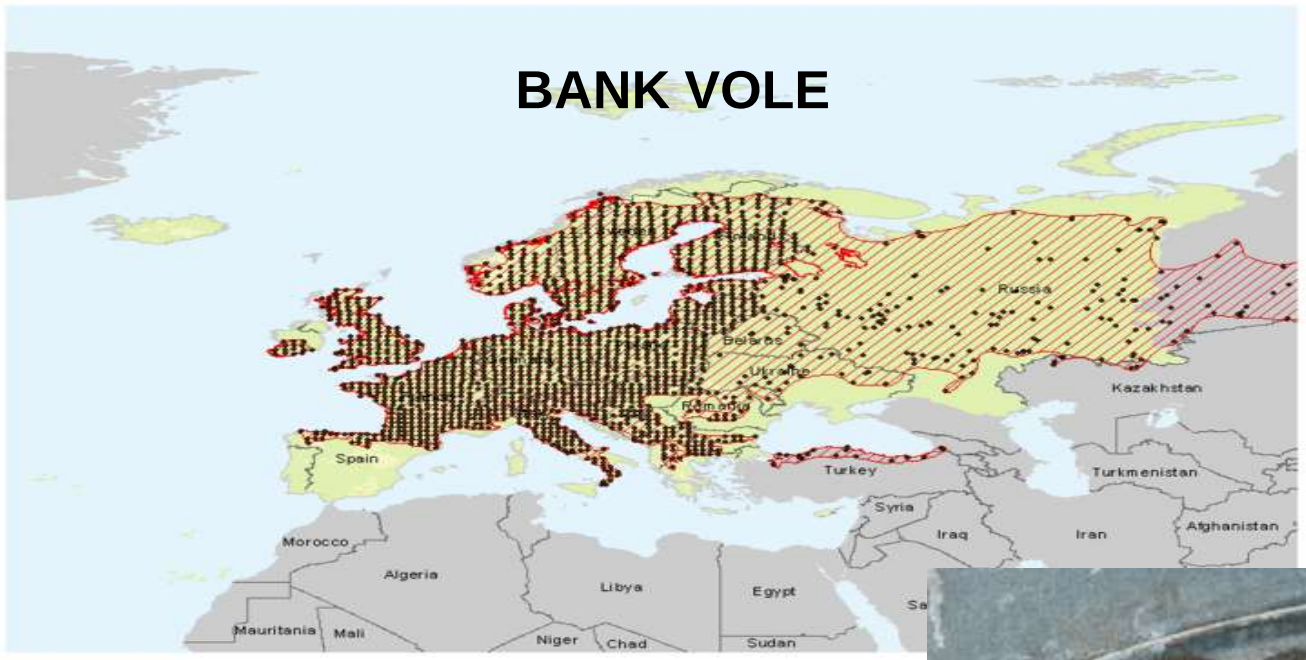

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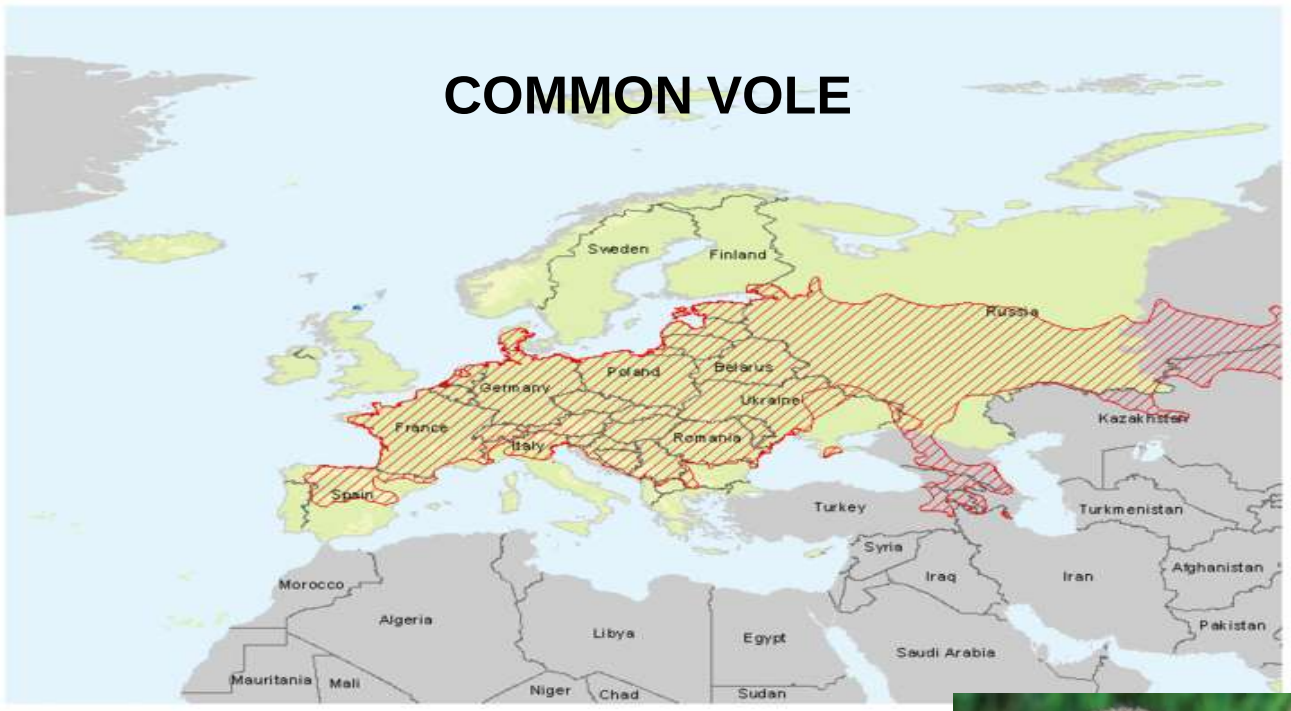

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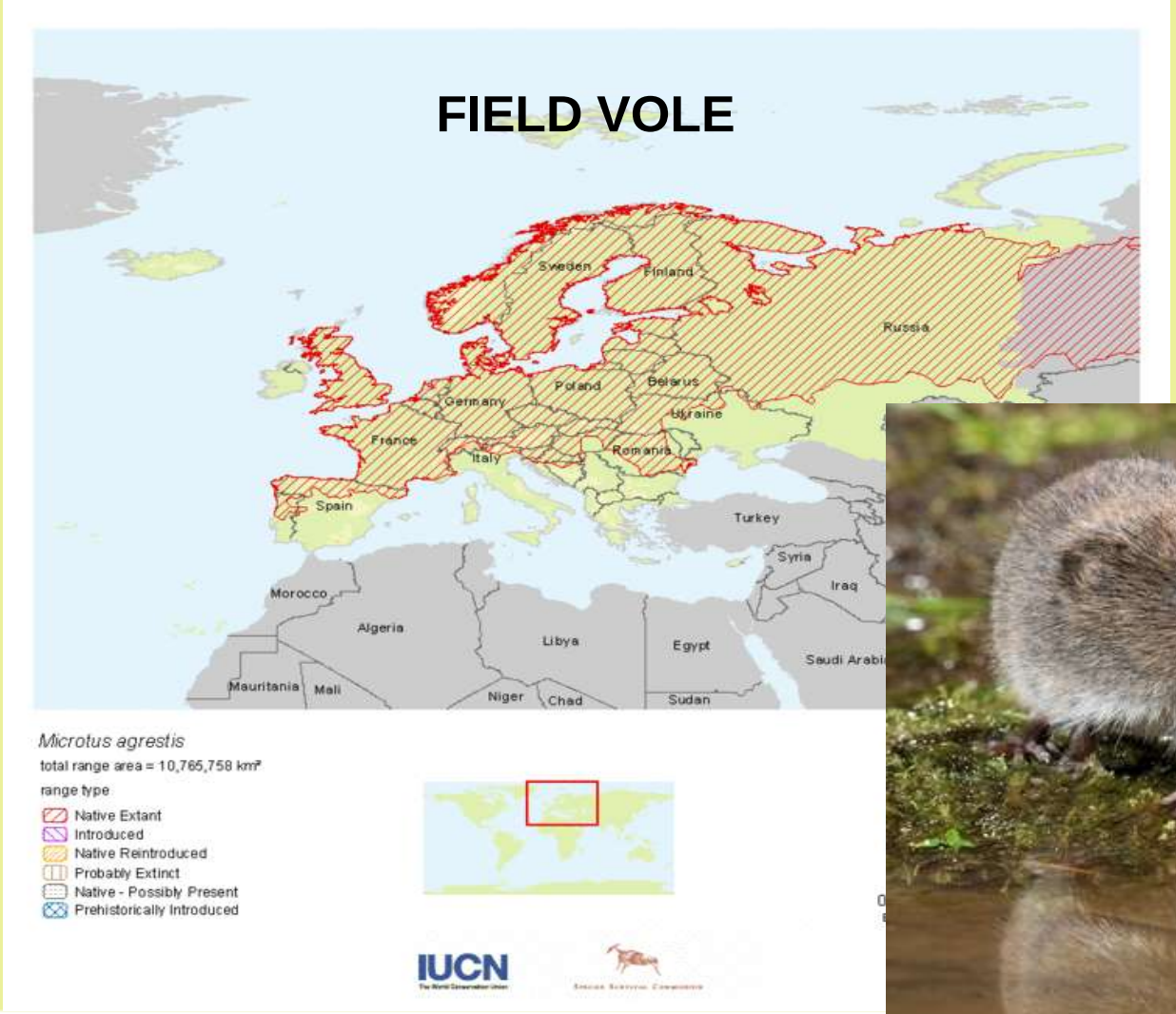

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Choice of indicator and focal species

MEDITERRANEAN PINE VOLE

SAVI'S PINE VOLE

THOMAS'S PINE VOLE

EAST EUROPEAN VOLE OR SIBLING VOLE

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Choice of indicator and focal species

Agricultural habitats in which vole species can be found.

English name	Grassland	Arable land	Pasture	Plantations
Bank vole	-	-	-	-
Field vole	X	X	X	X
Common vole	X	X	X	-
Cabrera's vole	X	-	X	-
Mediterranean pine vole	-	X	X	X
Balkan pine vole	-	X	-	-
Savi's pine vole	X	X	X	X
Sibling vole	-	X	X	-
Thomas's pine vole	X	X	X	-

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Choice of indicator and focal species

COMMON SHREW

The common shrew has a wide distribution in the Palaearctic, occurring from Britain through central, northern and eastern Europe and Asia as far east as Lake Baikal and as far north as the Arctic coast.

GREATER WHITE-TOOTHED SHREW

BICOLOURED WHITE-TOOTHED SHREW

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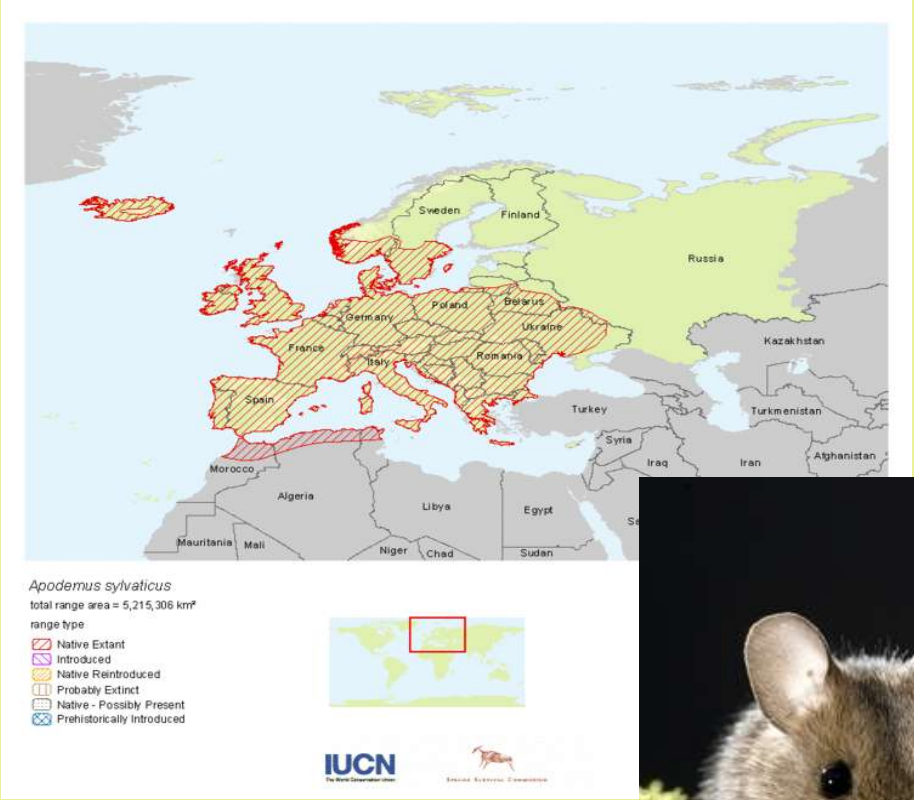
Choice of indicator and focal species

WOOD MOUSE



STRIPED WOOD MOUSE

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Choice of indicator and focal species

For the indicator and for the generic focal species it was proposed to use a body weight of 25 grams (a body weight comparable to the smaller species of voles)

There is no differentiation in food between the screening level and first tier assessment, because voles eat plant material and no other types of food.

The common shrew (9.7 grams) is proposed for insect eating mammals. Again no differentiation possible in food types.

The wood mouse (21.7 gram) is proposed for omnivorous mammals. In the screening level it is assumed that this indicator species will only eat plant material, which will result in the highest exposure. In the first tier it is assumed that the generic version will eat 25% plant material (leaves), 50% seeds and 25% insects.

Screening level shortcuts

Crop	Indicator species	Short cut value for mean RUDs	Short cut value for 90th percentile RUDs
Bare soil	Small granivorous mammal	6.6	14.4
Bush and cane fruit	Small herbivorous mammal	43.4	81.9
Bulbs and onion like crops, cereals, oilseed rape, potatoes, root and stem vegetables, strawberries, sugar beet, and sunflower	Small herbivorous mammal	48.3	118.4
Cotton, fruiting vegetables, grassland, leafy vegetables, legume forage, maize, orchards, ornamentals/nursery, pulses, and vineyard	Small herbivorous mammal	72.3	136.4

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First tier short cuts for

Crop	Growth stage	Generic focal species	Short cut for mean	Short cut for 90th percentile.
Potatoes	BBCH 10-19	Small insectivorous mammal “shrew”	4.2	7.6
Potatoes	BBCH ≥ 20	Small insectivorous mammal “shrew”	1.9	5.4
Potatoes	BBCH ≥ 40	Small herbivorous mammal "vole	21.7	40.9
Potatoes	BBCH 10-40	Large herbivorous mammal “lagomorph”	14.3	35.1
Potatoes	BBCH ≥ 40	Large herbivorous mammal “lagomorph”	4.3	10.5
Potatoes	BBCH 10-19	Small omnivorous mammal “mouse”	7.8	17.2
Potatoes	BBCH 20-39	Small omnivorous mammal “mouse”	7.5	16.9
Potatoes	BBCH ≥ 40	Small omnivorous mammal “mouse”	2.4	5.5

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Residue unit doses for different food types

Crop/category of insects	Crop stage	mean	Standard deviation	90th percentile[7]	n	Source
Grass+cereals	BBCH 10-30	54.2	55	102.3	132	ECPA database[6]
Non-grass weeds	Whole season	28.7	27.5	70.3	230	ECPA database[6]
Small fruits from orchards[1]	Fruiting period	3.3	2.6	6.5	33	Baril *et al.* (2005)
Large fruit from orchards[2]	Fruiting period	19.5	16.8	41.1	33	Baril *et al.* (2005)
Berries[3]	Fruiting period	8.3	7.2	16.7	9	Baril *et al.* (2005)
Tomato	Fruiting period	12.8	14.6	30.6	86	Baril *et al.* (2005)
Gourds	Fruiting period	34.3	54.7	61.5	19	Baril *et al.* (2005)
Grains/ear	Fruiting period	15	25.4	13.0	21	Baril *et al.* (2005)
Seeds	Fruiting period	40.2	50.6	87.0	108	EC (2002)
Ground dwelling invertebrates without interception[4]	ground directed applications	7.5	12.0	13.8	21	ECPA
Ground dwelling invertebrates with interception[5]	applications directed to crop canopies	3.5	3.8	9.7	28	ECPA&CSL
Insects (foliar dwelling invertebrates[8])	Whole season	21.0	21.6	54.1	35	ECPA&CSL (-aphids)

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Dietary intake versus LD_{50} per m^2

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Dietary risk assessment

- **The choice was between:**
  - **The LD_{50} per square meter approach, or**

Input only application rate and toxicity value

  - **The TER approach**

TER = Toxicity Exposure Ratio = LD_{50} / ETE

$$ETE = \frac{FIR}{BW} \times C \times PT \quad (mg/kg\ BW/d)$$

In which:

ETE = Estimated theoretical exposure
FIR = Food intake rate of indicator species (g fresh weight /d)
BW = Body weight (g)
C = Concentration of compound in fresh diet (mg/kg)
PT = Fraction of diet obtained in treated area (number between 0 and 1)

Dietary risk assessment

$$FIR = DEE / (FE * (1 - (MC / 100)) * (AE / 100))$$

In which:

DEE = Daily energy expenditure of the indicator species (kJ/d)
FE = Food energy (kJ/dry g)
MC = Moisture content (%)
AE = Assimilation efficiency (%)

The risk managers preferred to have one method for the different assessments, as well for birds and mammals and as for acute and reproductive assessments.

Geometric mean

versus

lowest available toxicity value

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Geometric mean approach

The advice of the PPR panel of the EFSA was to use the geometric mean of the available toxicity values instead of the lowest available toxicity value.

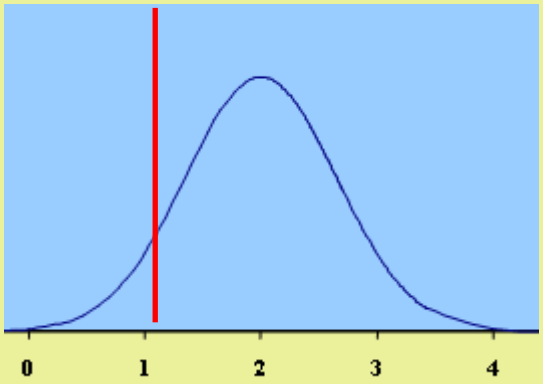
It was shown that this value together with the safety factor (as defined in 91.414) would ensure at least the same level of protection as implied in the directive.

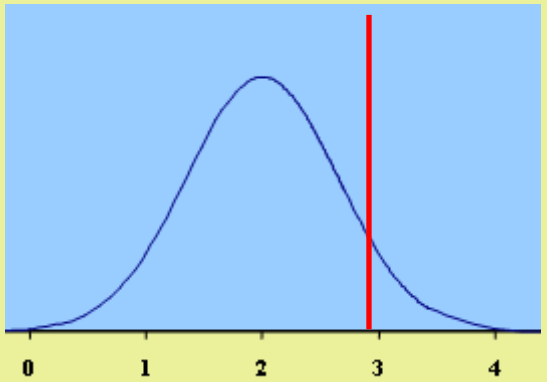
The Joint Working Group recognized the scientific logic and robustness of the geomean approach to addressing endpoints from multiple toxicity studies for different species.

However, there were concerns for situations where species sensitivity distribution was particularly wide.

Geometric mean approach

Toxicity value available





	Difference between lowest and highest toxicity value			
	1-10	10-100	100-1000	≥ 1000
Number of compounds	122	100	30	3

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Geometric mean approach

The Joint Working Group decided on the following approaches:

- The geomean should be used for the acute assessment, except when the lowest species is more than a factor of 10 below the geomean.
- Where this is the case, then the most sensitive species will be used for the risk assessment but generally without an assessment factor (unless there are specific reasons to believe that this is not appropriate).

The Joint Working Group decided that the reproductive assessment should continue to be based on the most sensitive species pending additional research.
The PPR Panel will therefore be asked to consider further the applicability of the geomean for NOEC from reproductive studies.

Geometric mean approach (some examples)

Suppose you have a number of LD50s and the geomean is 100, and the lowest LD50 is 20.

100/10 = 10 which is lower than 20, therefore, 10 will be used in the risk assessment.

Now suppose the lowest was 5.

This is lower than the geomean of 100/10 = 10, therefore, 5 will be used in the risk assessment.

Phase specific assessment

versus

former reproductive assessment

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Reproductive assessment

In the opinion it was proposed to use a new method: the phase specific risk assessment.

Breeding phase	Test endpoint used as surrogate	Short-term exposure	Long-term exposure
Pair formation/breeding site selection	1/10 of LD50 or specific NAOEL	1, 2 or 3 days Time weighted average Dietary Daily Dose	21 day time weighted average daily dose
Copulation and egg laying			
Incubation and hatching			
Juvenile growth and survival until fledging			
Post-fledging survival			

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Reproductive assessment

Move phase-specific approach to higher tier

Single tox endpoint:

- Mammals - lowest relevant endpoint from 2-gen rat
  - or outcome of teratogenetic study if lower
- Birds – lowest or geomean of relevant endpoints

Single exposure estimate:

- Use Long Term Exposure as default
- Use Short Term Exposure when evidence for substance in hand

Questions to PPR Panel :

- Criteria for when to use short term exposure estimates,
- Use of 1/10th LD50 for birds needs to be confirmed
- TWA period for LTE – study duration or 21d?

Acknowledgement

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Scientific Opinion of the Panel on Plant protection products and their Residues (PPR) on the Science behind the Guidance Document on Risk Assessment for birds and mammals.
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http://www.efsa.europa.eu/EFSA/efsa_locale-1178620753812_1211902014630.htm

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