Appendix to:

EFSA (European Food Safety Authority), 2016. Conclusion on the peer review of the pesticide risk assessment of the active substance *Pseudomonas chlororaphis* MA 342 EFSA Journal 2017;15(1):4668, 14 pp. doi:10.2903/j.efsa.2017.4668

© European Food Safety Authority, 2017

Appendix A – List of end points for the active substance and the representative formulation

**Identity, Biological properties, Details of uses, Further information, and Proposed Classification and Labelling**

| Active microorganism: | *Pseudomonas chlororaphis* strain MA 342 |
|-----------------------|-----------------------------------------|
| Function (e.g. control of fungi): | Fungicide |

**Rapporteur Member State:** The Netherlands

**Co-rapporteur Member State:** Denmark

**Identity of the Microbial or Viral Agent used in plant protection / Active Substance** (Regulation (EU) N° 283/2013, Annex Part B, point 1; OECD IIM Point 1)

| Name of the organism: | *Pseudomonas chlororaphis* MA 342 |
|-----------------------|-----------------------------------|
| Taxonomy: | Kingdom Bacteria  |
| | Phylum Proteobacteria |
| | Class γ-Proteobacteria |
| | Order Pseudomonadales |
| | Family Pseudomodaceae |
| | Genus *Pseudomonas* |
| | Species *Pseudomonas chlororaphis* |
| | Strain: *Pseudomonas chlororaphis* strain MA 342 |
| | Species *Pseudomonas chlororaphis*, strain *Pseudomonas chlororaphis* MA 342 |
| | Identification / detection: Identification of the isolate was based on fatty acid analysis, and confirmed by molecular characterisation techniques as Restriction Fragment Length Polymorphism (RFLP) analysis of the 16s rRNA gene and Randomly Amplified Polymorphic DNA (RAPD). |
| Culture collection: | NCIMB, UK: NCIMB 40616 |
Minimum and maximum concentration of the MPCA used for manufacturing of the formulated product (cfu; g/kg):

- Minimum: \(1.5 \times 10^{10}\) CFU/ml
- Maximum: \(3.0 \times 10^{10}\) CFU/ml

Identity and content of relevant impurities, additives, contaminating organisms in the technical grade of MPCA:

- 2,3-deepoxy-2,3-didehydro-rhizoxin (DDR)
  - Max: < 2.0 mg/L

Is the MPCA genetically modified; if so provide type of modification

- The strain is not genetically modified

**Biological properties of the microorganism** (Regulation (EU) N° 283/2013, Annex Part B, point 2; OECD IIM Point 2)

| Property                          | Description |
|----------------------------------|-------------|
| Origin and natural occurrence,   | *P. chlororaphis* MA342 exists as the pure active in the technical product and was isolated from the roots of crowberry (*Empetrum nigrum* L.) in Sweden. |
| Background level:                | *P. chlororaphis* are ubiquitous soil bacteria and widespread all over the world and associated to various plants. However, background levels data are not available neither for the species nor for the strain MA342. |
| Target organism(s):              | Soil borne plant pathogenic fungi |
| Mode of action:                  | Competition for space and nutrients with pathogenic fungi, antibiosis/fungistasis. In investigations with different strains of *P. chlororaphis* the key role of the metabolites (volatile and non-volatile antibiotics) in the antifungal activity is demonstrated even in the absence of the live bacteria. |
| Host specificity:                | Activity of *P. chlororaphis* MA 342 is not specific to certain hosts. Activity was demonstrated against several plant pathogenic fungi. |
| Life cycle:                      | *P. chlororaphis* MA 342 belongs to the ubiquitous saprophytic bacteria. It replicates as other bacteria by cell division. As it does not produce other resting stages (e.g. spores), it only exists as living bacterial cells. |
| Infectivity, dispersal and colonization ability: | *P. chlororaphis* MA 342 is able to colonize soil, roots and shoots, but mainly the rhizosphere of plants. During plant development, bacterial population densities decrease strongly, especially in distances >5 cm from seeds. |
| Relationships to known plant, animal or human pathogens: | Although several *Pseudomonas* types are known to be pathogen on plants, humans and animals, *P. chlororaphis* MA 342 is not closely related to plant, animal or human pathogens and pathogenicity on |
| Genetic stability: | plants, animals or humans is not expected. |
|-------------------|------------------------------------------|
| Gene transfer under natural conditions cannot be fully ruled out (data gap). |

| Information on the production of relevant metabolites (especially toxins): | \( P. \text{chlororaphis} \) MA 342 can produce the metabolite 2,3-deepoxy-2,3-didehydro-rhizoxin (DDR). The amount of the secondary metabolite 2,3-deepoxy-2,3-didehydro-rhizoxin (DDR) in the fermentate at the point of formulation of the product must not exceed the LOQ (2 mg/l). A data gap has been identified for the identification and assessment of the toxicological and ecotoxicological relevance of the \( P. \text{chlororaphis} \) strain MA 342 metabolites produced in the environment. In particular, DDR and other potential metabolites (eg. phenazines,, 2R-3R-butanediol, 4-ACPA, HCN, Prn, HPR, Fit toxin). |

| Resistance/ sensitivity to antibiotics / antimicrobial agents used in human or veterinary medicine: | \( P. \text{chlororaphis} \) MA 342 does not grow on gentamicin, kanamycin, tetracyclin 20 ppm or streptomycin 40 ppm. It does grow on chloramphenicol, ampicillin, spectinomycin 20-100 ppm and rifampicin 20-50 ppm. |
## Summary of uses supported by available data (Regulation (EU) No 283/2013, Annex Part B, point 3; OECD IIM Point 3)

| Use-No. | Member state(s) | Crop and/or situation | Pests or Group of pests controlled | Method / Kind | Timing / Growth stage of crop & season | Max. number (min. interval between applications) | Application | Application rate | Remarks: |
|---------|-----------------|-----------------------|------------------------------------|---------------|--------------------------------------|-----------------------------------------------|--------------|-----------------|----------|
| 1       | EU              | Cereals (Wheat, rye and triticale) | Seed-borne diseases | Seed treatment | BBCH 00 | 1 | a) = b): 2.2 L/ha (assuming 220 kg seed/ha) | a) = b): 442.64 g as/ha (assuming 220 kg seed/ha) | a) = b): 2.2 \times 10^{13} | Not applicable, no dispersal |
| 2       | EU              | Carrot                | Seed-borne diseases | Seed treatment | BBCH 00 | 1 | a) = b): 0.4 L/ha (assuming 10 kg seed/ha) | a) = b): 80.48 g a.s./ha (assuming 10 kg seed/ha) | a) = b): 4 \times 10^{12} | Not applicable, no dispersal |
| 3       | EU              | Pea                   | Seed-borne diseases | Seed treatment | BBCH 00 | 1 | a) = b): 2 L/ha (assuming 200 kg seed/ha) | a) = b): 402.4 g a.s./ha (assuming 200 kg seed/ha) | a) = b): 2.0 \times 10^{13} | Not applicable, no dispersal |
| 4       | EU              | Cereals               | Foliar pathogens (e.g. Septoria tritici) and/or ear pathogens (e.g. Fusarium spp.) | Foliar application | BBCH 30-69 March - August | a) 3 (7 days) b) 3 | a) = b): 1-3 L/ha applied either as 1 x 3L or 3 applications of 1 L b) 3 L/ha | a) = b): 603.6 g a.s./ha | a) = b): 3.0 \times 10^{13} | 150-400 L | Not relevant |

1. Seed treatment: seeds are treated indoor and treated seeds are sown in the field
**Classification and proposed labelling (Symbol, Indication of danger, Risk phrases, Safety phrases)**

| Category                                                      | Classification and Proposed Labelling |
|---------------------------------------------------------------|--------------------------------------|
| with regard to physical/chemical data:                        | Not classified in the sense of Regulation (EC) 1272/2008 |
| with regard to toxicological data:                            | Not classified in the sense of Regulation (EC) 1272/2008 Micro-organisms may have the potential to provoke sensitising reactions. |
| with regard to fate and behaviour:                           | Not classified in the sense of Regulation (EC) 1272/2008 |
| with regard to ecotoxicological data:                         | Not classified in the sense of Regulation (EC) 1272/2008 |

**Methods of analysis** (Regulation (EU) Nº 283/2013, Annex Part B, point 4 and Regulation (EU) Nº 284/2013, Annex Part B, point 5)

**Analytical methods for the microorganism** (MA 4.1 & MP 5.1; OECD IIM 4.3 & IIIM 5.1)

| Manufactured microorganism (principle of method):              | Enumeration of colony forming units by plate count method. |
|                                                               | Characterisation by biochemical/nutritional characterisation tests as e.g. API test kits, fatty acid pattern and molecular characterisation techniques: Restriction Fragment Length Polymorphism (RFLP) analysis of the 16s rRNA gene and Randomly Amplified Polymorphic DNA (RAPD). |

| Impurities and contaminating microorganisms in manufactured material (principle of method): | Enumeration & identification of microbial contaminants by means of selective media and plate count method. |
|                                                                                           | DDR (2,3-deeypoxy-2,3-didehoro-rhizoxin): HPLC-DAD, LOQ 2 mg/L in TGAI / MPCA |

| Microbial Pest Control Product (principle of method):          | Enumeration of colony forming units by plate count method. |
|                                                               | Open |

**Analytical methods for residues (viable and non-viable) in exposed compartments and organisms**

(MA 4.2 & MP 5.2; OECD IIM 4.5 & IIIM 5.2)

| of the active microorganism (principle of method):             | Open |
|                                                               | No residue definition is expected, therefore no residue methods are provided. |
| of relevant metabolites (principle of method):                 | No residue definition is expected, therefore no residue methods are provided. |
Impact on Human and Animal Health (Regulation (EU) No 283/2013, Annex Part B, point 5 and Regulation (EU) No 284/2013, Annex Part B, point 7)

Medical data:
(including medical surveillance on manufacturing plant personnel) (MA 5.1.1; OECD IIM 5.1)

Sensitisation:
(MA 5.2.1 & MP 7.2.3; OECD IIM 5.2 & IIIM 7.1.6)

Acute oral infectivity, toxicity and pathogenicity:
(MA 5.2.2.1 & MP 7.1.1; OECD IIM 5.3.2 & IIIM 7.1.1)

Acute intratracheal/inhalation infectivity, toxicity and pathogenicity:
(MA 5.2.2.2 & MP 7.1.2; OECD IIM 5.3.3 & IIIM 7.1.3)

Acute intravenous/intraperitoneal infectivity:
(MA 5.2.2.3; OECD IIM 5.3.4)

Genotoxicity:
(MA 5.2.3; OECD IIM 5.3.5)

Genotoxicity – in vivo studies in germ cells:
(MA 5.5; OECD IIM 5.5.3)

Cell culture study:
(MA 5.2.4; OECD IIM 5.3.6)

Information on short-term toxicity and pathogenicity:
(MA 5.2.5; OECD IIM 5.3.7)

Dermal toxicity:
(MP 7.1.3; OECD IIIM 7.1.2)

Specific toxicity, pathogenicity and infectivity:

Health surveillance of workers in research or production of *P. chlororaphis* strain MA342 has not revealed signs or symptoms related to occupational exposure.

No sensitisation or allergenic responses have occurred or have been reported for the staff involved in research or production with strain *P. chlororaphis* strain MA 342 during more than 14 years. *P. chlororaphis* strain MA 342 was found to be not sensitising to Guinea pigs according to the Buehler method.

Warning phrase for microorganisms is applicable: "*Pseudomonas chlororaphis* strain MA 342 may have the potential to provoke sensitising reactions".

LD<sub>50</sub> rat > 2 × 10<sup>10</sup> CFU/ kg bw (*P. chlororaphis* strain MA 342). No mortality, no toxicity.

LD<sub>50</sub> rat > 1.8 × 10<sup>8</sup> CFU/animal (*P. chlororaphis* strain MA 342). No mortality, no toxicity.

Infectivity/pathogenicity inconclusive (data gap)

NOAEL, rat > 1 × 10<sup>6</sup> CFU/animal (*P. chlororaphis* MA 342). No signs of toxicity or infectivity observed upon intratracheal administration.

NOAEL, rat > 5× 10<sup>5</sup> CFU/animal (Cedomon, bacterial suspension of *P. chlororaphis* strain MA 342 in a carrier). No test item-related signs of toxicity observed. No infectivity.

A study on the acute intravenous/intraperitoneal infectivity of *P. chlororaphis* MA 342 is considered to be not required.

*P. chlororaphis* MA 342 produces the metabolite 2,3-deepoxy-2,3-didehydro-rhizoxin (DDR) which has been shown to produce aneuploidy *in vitro* and *in vivo*.

The metabolite 2,3-deepoxy-2,3-didehydro-rhizoxin (DDR) produced by *P. chlororaphis* MA 342 has been shown to produce aneuploidy *in vitro* and *in vivo*.

Not relevant

To be reconsidered, pending further clarification of the clearance and of the growth temperature.

A study to assess the acute dermal toxicity of the formulation Cerall is considered to be not required since bacteria do not penetrate intact skin. Furthermore, *P. chlororaphis* MA 342 has been shown not to be a skin irritant or a skin sensitizer and no other ingredient in the formulation Cerall is classified regarding acute dermal toxicity.

Experimental safety tests with *P. chlororaphis* MA
342 have been conducted in rats upon oral, and respiratory applications of acute single doses. No adverse effects were reported. No signs of infectivity or accumulation were observed.

**Reference values**

| ADI, ARfD and AOEL | Not needed for *P. chlororaphis* strain MA 342
|--------------------|-------------------------------------------------|
|                    | Open for DDR and possible toxins/secondary metabolites present in the formulation and/or produced after application. |

**Exposure (operator, workers, bystanders, residents):**

(MA 6.1 & MP 7.3, 8.0; OECD IIM 5.6 & IIIM 7.2, 7.3)

Exposure estimates to the microorganism are not needed.

**DDR:**

First tier assessment with the TTC value for genotoxic substances (0.0025 µg/kg bw):
- operators during seed treatment: margin of safety ~80
- operators during foliar application: margin of safety ~44
- bystanders: margin of safety > 100
- workers and residents: cannot be concluded

Open for possible other toxins/secondary metabolites.

**Residues** (Regulation (EU) N° 283/2013, Annex Part B, point 6 and Regulation (EU) N° 284/2013, Annex Part B, point 8; OECD IIM Point 6 & IIIM Point 8)

| Viable residues | The consumer risk assessment for the uses of *P. chlororaphis* strain MA 342 cannot be finalised as long as a conclusion that *P. chlororaphis* strain MA 342 will not lead to unacceptable effects on human health is pending |
|-----------------|-------------------------------------------------------------------|
| Non-viable residues | First tier assessment (TTC) failed to demonstrate consumer safety with regard to metabolite DDR (452% TTCgenotox in the chronic scenario and up to 2540% TTCgenotox in the acute scenario). |
Fate and Behaviour in the Environment (Regulation (EU) N° 283/2013, Annex Part B, point 7 and Regulation (EU) N° 284/2013, Annex Part B, point 9; OECD IIM Point 7 & IIIM Point 9)

Persistence and multiplication (competitiveness) in soil, water and air:

Information on persistence and mobility of *Pseudomonas chlororaphis* MA 342 in soil, available in the peer reviewed scientific literature, indicates certain capacity to proliferate in soil after application in carrots and onions.

A data gap has been identified for information or studies to address data requirements set out in Regulation (EU) No 283/2013 ANNEX PART B 7.1.1 and 7.1.2.

Mobility:

A data gap has been identified for the applicant to provide information in relation to the mobility of the microorganism in the environment as required in Regulation (EU) No 283/2013 ANNEX PART B 7.2

Effects on non-target organisms (Regulation (EU) N° 283/2013, Annex Part B, point 8 and Regulation (EU) N° 284/2013, Annex Part B, point 10; OECD IIM Point 8 & IIIM Point 10)

Effects on birds and other terrestrial vertebrates (MA 8.1 & MP 10.1; OECD IIM 8.1 & IIIM 10.1)

| Dosage | Test substance | Category (e.g. insectivorous bird) and species | Time-scale | Toxicity, infectivity and pathogenicity (endpoint, value or other description of effects) |
|--------|----------------|---------------------------------------------|------------|-------------------------------------------------------------------------------------|
| unknown | *Pseudomonas chlororaphis* MA 342 | chicken | 36 days | No effects.  
Infectivity and pathogenicity were not studied. |
| 1.8 x 10^8 CFU /kg bw | *P. chlororaphis* strain MA 342 suspended in sterile 0.9% NaCl (1 x 10^8 CFU/mL) | Acute oral toxicity rat | No mortalities.  
No signs of toxicity.  
No conclusion on infectivity and pathogenicity. |
| DDR | | | No studies available.  
Data gap |

Effects on aquatic organisms (MA 8.2 & 10.2; OECD IIM 8.2, 8.3 & IIIM 10.2)

| Group | Test substance | Time-scale | Toxicity, infectivity and pathogenicity (endpoint, value or other description of effects) |
|-------|----------------|------------|-------------------------------------------------------------------------------------|
| Laboratory tests | | | |
| Fish species: | | | |
| *Oncorhynchus mykiss* | *Pseudomonas chlororaphis* | 96 h | mortality, behavior  
LC50: 20.2 x 10^10 CFU/L  
NOEC= 1.4 x 10^10 CFU/L based on clinical symptoms  
No conclusion on infectivity and pathogenicity. |
| Invertebrate species: | | | |
| Data gap | | | |
| Algae species: | | | |
| *Pseudokirchneriella subcapitata* | *Pseudomonas chlororaphis*, strain | 4 d | EC_{50} > 7.81 x 10^8 CFU/L  
NOEC 7.81 x10^8 CFU/L |
**Aquatic plants:**
Not required

**Effects on bees** (MA 8.3 & MP 10.3; OECD IIM 8.7 & IIIM 10.3)

| Species       | Test Substance | Route/time-scale | Toxicity, infectivity and pathogenicity (endpoint, value or other description of effects) |
|---------------|----------------|------------------|---------------------------------------------------------------------------------------------|
| Apis mellifera | *P. chlororaphis* MA342 | oral 48h         | $1.09 \times 10^5$ cfu/bee, study duration too short to investigate infectivity and pathogenicity |
|               |                 | contact 48h      | $9.6 \times 10^4$ cfu/bee, study duration too short to investigate infectivity and pathogenicity |

**Effects on terrestrial arthropods other than bees** (MA 8.4 & MP 10.4; OECD IIM 8.8 & IIIM 10.4)

Non-target arthropods are naturally exposed to many *Pseudomonas* spp., some of them form even part of their intestinal tract. It was demonstrated that the FitD gene for expression of insecticidal toxin, present in some other *Pseudomonas* strains, is absent in *P. chlororaphis* MA342. Based on the results of the study by Flury et al. (2016), the RMS is of opinion that the absence of the FitD toxin from the current strain does not completely exclude the insecticidal activity. The presence of other genes associated with the insecticidal activity cannot be excluded in strain MA 342, and it therefore also cannot be excluded that the strain might have insecticidal activity in the larvae of various other insects (including bees). Considering the above, further information to address the risk to non-target arthropods is needed.
Abbreviations

1/n slope of Freundlich isotherm
λ wavelength
ε decadic molar extinction coefficient
a.s. active substance
AChE acetylcholinesterase
ADE actual dermal exposure
ADI acceptable daily intake
AF assessment factor
AAOEL acute acceptable operator exposure level
AOEL acceptable operator exposure level
AP alkaline phosphatase
AR applied radioactivity
ARfD acute reference dose
AST aspartate aminotransferase (SGOT)
AUC area under the blood concentration/time curve
AV avoidance factor
BCF bioconcentration factor
BUN blood urea nitrogen
bw body weight
CAS Chemical Abstracts Service
CFU colony-forming units
ChE cholinesterase
CI confidence interval
CIPAC Collaborative International Pesticides Analytical Council Limited
CL confidence limits
Cmax concentration achieved at peak blood level
DAA days after application
DAT days after treatment
DDD daily dietary dose
DM dry matter
DT50 period required for 50% dissipation (define method of estimation)
DT90 period required for 90% dissipation (define method of estimation)
dw dry weight
EbC50 effective concentration (biomass)
EC50 effective concentration
ECHA European Chemicals Agency
EEC European Economic Community
| Acronym | Description |
|---------|-------------|
| EMDI    | estimated maximum daily intake |
| ER<sub>50</sub> | emergence rate/effective rate, median |
| ErC<sub>50</sub> | effective concentration (growth rate) |
| ETR     | exposure toxicity ratio |
| ETR<sub>acute</sub> | exposure toxicity ratio for acute exposure |
| ETR<sub>larvae</sub> | exposure toxicity ratio for chronic exposure |
| ETR<sub>larvae</sub> | exposure toxicity ratio for larvae |
| ETR<sub>HPG</sub> | exposure toxicity ratio for effects on honeybee hypopharyngeal glands |
| EU      | European Union |
| EUROPOEM| European Predictive Operator Exposure Model |
| f(twa)  | Time-weighted average factor |
| FAO     | Food and Agriculture Organization of the United Nations |
| FID     | flame ionisation detector |
| FIR     | food intake rate |
| FOB     | functional observation battery |
| FOCUS   | Forum for the Co-ordination of Pesticide Fate Models and their Use |
| GAP     | Good Agricultural Practice |
| GC      | gas chromatography |
| GCPF    | Global Crop Protection Federation (formerly known as International Group of National Associations of Manufacturers of Agrochemical Products; GIFAP) |
| GGT     | gamma glutamyl transferase |
| GM      | geometric mean |
| GS      | growth stage |
| GSH     | glutathione |
| Hb      | haemoglobin |
| Hct     | haematocrit |
| HPLC    | high-pressure liquid chromatography |
| HPLC-MS | high-pressure liquid chromatography–mass spectrometry |
| HPG     | hypopharyngeal glands |
| HQ      | hazard quotient |
| HQ<sub>contact</sub> | hazard quotient for contact exposure |
| HR      | hazard rate |
| IEDI    | international estimated daily intake |
| IESTI   | international estimated short-term intake |
| ISO     | International Organization for Standardization |
| IUPAC   | International Union of Pure and Applied Chemistry |
| iv      | intravenous |
Peer review of the pesticide risk assessment of the active substance *Pseudomonas chlororaphis* MA 342

JMPR Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues (Joint Meeting on Pesticide Residues)

**K**<sub>so</sub> organic carbon linear adsorption coefficient

**K**<sub>Foc</sub> Freundlich organic carbon adsorption coefficient

**LC** liquid chromatography

**LC**<sub>50</sub> lethal concentration, median

**LC-MS** liquid chromatography–mass spectrometry

**LC-MS-MS** liquid chromatography with tandem mass spectrometry

**LD**<sub>50</sub> lethal dose, median; dosage lethal media

**LDD**<sub>50</sub> lethal dietary dose; median

**LDH** lactate dehydrogenase

**LOAEL** lowest observable adverse effect level

**LOD** limit of detection

**LOQ** limit of quantification

**M/L** mixing and loading

**MAF** multiple application factor

**MCH** mean corpuscular haemoglobin

**MCHC** mean corpuscular haemoglobin concentration

**MCV** mean corpuscular volume

**mm** millimetre (also used for mean measured concentrations)

**mN** milli-newton

**MRL** maximum residue level

**MS** mass spectrometry

**MSDS** material safety data sheet

**MTD** maximum tolerated dose

**MWHC** maximum water-holding capacity

**NESTI** national estimated short-term intake

**NOAEC** no observed adverse effect concentration

**NOAEL** no observed adverse effect level

**NOEC** no observed effect concentration

**NOEL** no observed effect level

**NPD** nitrogen–phosphorus detector

**OECD** Organisation for Economic Co-operation and Development

**OM** organic matter content

**Pa** pascal

**PD** proportion of different food types

**PEC** predicted environmental concentration
| Abbreviation | Description |
|--------------|-------------|
| PEC<sub>air</sub> | predicted environmental concentration in air |
| PEC<sub>gw</sub> | predicted environmental concentration in groundwater |
| PEC<sub>sed</sub> | predicted environmental concentration in sediment |
| PEC<sub>soil</sub> | predicted environmental concentration in soil |
| PEC<sub>sw</sub> | predicted environmental concentration in surface water |
| PHEED | pesticide handler’s exposure data |
| PHI | pre-harvest interval |
| PIE | potential inhalation exposure |
| pK<sub>a</sub> | negative logarithm (to the base 10) of the dissociation constant |
| P<sub>ow</sub> | partition coefficient between n-octanol and water |
| PPE | personal protective equipment |
| ppm | parts per million (10<sup>-6</sup>) |
| PT | proportion of diet obtained in the treated area |
| PTT | partial thromboplastin time |
| QSAR | quantitative structure–activity relationship |
| r<sup>2</sup> | coefficient of determination |
| RPE | respiratory protective equipment |
| RUD | residue per unit dose |
| SC | suspension concentrate |
| SD | standard deviation |
| SFO | single first-order |
| SMILES | simplified molecular-input line-entry system |
| SPG | specific protection goal |
| SSD | species sensitivity distribution |
| STMR | supervised trials median residue |
| t<sub>1/2</sub> | half-life (define method of estimation) |
| TER | toxicity exposure ratio |
| TER<sub>A</sub> | toxicity exposure ratio for acute exposure |
| TER<sub>LT</sub> | toxicity exposure ratio following chronic exposure |
| TER<sub>ST</sub> | toxicity exposure ratio following repeated exposure |
| TK | technical concentrate |
| TLV | threshold limit value |
| Tmax | time until peak blood levels achieved |
| TMDI | theoretical maximum daily intake |
| TRR | total radioactive residue |
| TSH | thyroid-stimulating hormone (thyrotropin) |
| TWA | time-weighted average |
| UDS | unscheduled DNA synthesis |
| Abbreviation | Description |
|--------------|-------------|
| UF | uncertainty factor |
| UV | ultraviolet |
| W/S | water/sediment |
| w/v | weight per unit volume |
| w/w | weight per unit weight |
| WBC | white blood cell |
| WG | water-dispersible granule |
| WHO | World Health Organization |