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Acute reference doses for agricultural and veterinary chemicals

Edition 2/2022, current as of 30 June 2022

Introduction

The acute reference doses for agricultural and veterinary chemicals (ARfD list) provides a tabulation of acute reference doses (ARfDs; in units of mg/kg bodyweight) for each agricultural or veterinary (agvet) chemical listed.

The ‘Date’ column indicates when particular ARfDs were established.

The 'Study' column provides information about the pivotal study, including type, the NOAEL (no-observed-adverse-effect level) and the critical toxicological endpoint. For some agvet chemicals, longer-term rather than acute dosing studies have been used to establish the ARfD. In these cases, the NOAEL was selected on the basis of toxicological effects observed after the first dose.

The ‘Comments’ column may:

1. provide additional information about its applicability to the general population
2. advise that an ARfD is not necessary
3. indicate that the ARfD has been adopted from that established by the FAO/WHO Joint Meeting on Pesticide Residues (JMPR).

Contact

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Printable version

View a printable PDF or word version of the ARfD list.

ARfD list

Select a letter below to view chemicals in the ARfD list by alphabetical order.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Abamectin (sum of abamectin + 8,9–Z Isomer)	0.002	0.25	6 August 2018	Based on the overall NOAEL of 0.25 mg/kg bw per day for clinical signs in dogs (mydriasis) observed in the first week of treatment at 0.5 mg/kg bw per day.	A total uncertainty factor of 100 has been applied. The ARfD also applies to the 8,9–Z isomer of avermectin B_{1a} and 24-hydroxymethyl abamectin. The 24-hydroxymethyl metabolite of abamectin is regarded as having no greater toxicity than the parent molecule.
Acephate	0.1	≥ 1.2	2005	Single dose study in humans. No inhibition of erythrocyte acetylcholinesterase activity was reported in either sex at any dose. No clinically significant changes were seen in vital signs or on electrocardiography, haematology, clinical chemistry, urine analysis or physical examination. The NOAEL was 1.2 mg/kg bw per day, the highest dose tested.	The critical toxicological effect of acephate is the inhibition of acetylcholinesterase activity in the nervous system, an effect that is dependent on Cmax rather than on the area under the curve (AUC). Data on inhibition in vitro indicate that human brain acetylcholinesterase is slightly less sensitive to inhibition by acephate than is rat brain acetylcholinesterase. Well conducted toxicokinetics studies, available for both rats and humans, show that there is no significant difference between the two species; in particular, Cmax values have the same relationship to administered dose in the two species, and acephate is rapidly absorbed and eliminated in both species.

					Data for rats in vivo indicate that inhibition of brain acetylcholinesterase activity occurs at lower doses than those required for a similar level of inhibition of erythrocyte acetylcholinesterase activity. Data for dogs and monkeys in vivo indicate that brain and erythrocyte acetylcholinesterase activities are nearly equally inhibited at any given dose, and do not show the difference seen in rats, which might thus be rat-specific. Well-conducted single and repeated-dose studies in humans clearly demonstrated a dose where no inhibition of blood cholinesterase activities occurred. Data from animals in vivo do not show sex differences in inhibition of acetylcholinesterase activity or clinical signs. Since there is no interspecies extrapolation, an overall safety factor of 10 was used.
Acequinocyl	0.08	8	13 January 2021	Rat mechanistic studies; single oral dose produced effects on blood coagulation (increases in prothrombin and activated partial thromboplastin time) at higher doses.	
Acetamiprid	0.1	10	27 July 2001	Single-dose gavage neurotoxicity rat study; a NOAEL of 10 mg/kg bw was based on reductions in locomotor activity at the next higher dose.	

Acibenzolar-S-methyl	0.01	10 [LOAEL]	23 April 2002	Developmental rat study; based on haemorrhagic discharge in dams at LOAEL of 10 mg/kg bw/d.	
Aclonifen			24 November 2020		ARfD considered to be unnecessary due to its low acute toxicity, the lack of evidence for any acute neurotoxicity and the absence of any other toxicologically relevant effect that might be attributable to a single dose.
Afidopyropen	0.3	30	27 November 2017	Developmental rabbit studies; an overall NOAEL of 30–32 mg/kg bw/d was based on inappetence observed at the next higher dose.	ARfD for afidopyropen applies to the general population.
Aldicarb	0.001	0.01	15 December 1999	Human acute study; a NOAEL of 0.01 mg/kg bw was based on significant and dose-related RBC AChE inhibition at the next higher dose.	
Ametoctradin			1 February 2012		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Amicarbazone	0.1	10	9 June 2006	Acute neurotoxicity study; a NOAEL of 10 mg/kg bw was based on clinical signs of neurotoxicity at the next higher dose.	
Aminopyralid			10 January 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Amisulbrom			14 June 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Atrazine			5 December 2000		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Aureobasidium pullulans			21 February 2017		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Azafenidin	0.016	16	4 July 2001	Developmental rat study; a NOAEL of 16 mg/kg bw/d was based on increased incidence of resorptions (predominantly early) at the next higher dose.	ARfD for azafenidin only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Azimsulfuron			10 January 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Azinphos-methyl	0.075	0.75	5 December 2000	Acute human study; a NOAEL of 0.75 mg/kg bw was based on the absence of RBC ChE inhibition or clinical signs.	
Azoxystrobin			21 April 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Bacillus amyloliquefaciens			9 May 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Bacillus licheniformis			9 May 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Bacillus sphaericus strain 2362			9 May 2003		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Bacillus subtilis (see Bacillus amyloliquefaciens)					
Bacillus thuringiensis			6 September 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.

Bacillus thuringiensis subsp. thuringiensis serotype 1 (strain MPPL 002)			28 August 2003		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Beauveria bassiana			8 August 2017		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Bentazone			21 April 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Benzovindiflupyr	0.1	10	23 July 2018	Clinical observations, (decreased locomotor activity at 1 h post-dosing and reduced forelimb grip strength in females at 1 h post-dosing).	
Benzylpenicillin procaine			10 October 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Bicyclopyrone	0.01	1	10 January 2017	Developmental rabbit study; a NOAEL of 1 mg/kg bw/d was based on increased incidence of urogenital malformations along with skeletal variations at the next higher dose.	ARfD for bicyclopyrone only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

Bifenazate			10 January 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Bitertanol			21 April 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Bixafen	0.2	20	18 January 2016	Developmental rat study; a NOAEL of 20 mg/kg bw/d was based on reduced body weight gain in dams and foetuses at the next higher dose.	
Bixlozone			6 April 2020		ARfD considered to be unnecessary due to its low oral toxicity and and the absence of any developmental toxicity or neurological effects after a single dose.
Boscalid			10 January 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Bromide			10 October 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Bromoxynil	0.05	5	7 May 2021	Developmental rat study; a NOAEL of 20 mg/kg bw/d was based on reduced numbers of live foetuses, foetal weight, increased late uterine deaths and decreased maternal body weight, along with microphthalmia and minor skeletal variations at maternotoxic doses.	The ARfD applies to bromoxynil and its esters, expressed as bromoxynil phenol equivalents. ARfD only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Bupivacaine			17 February 2017		There was insufficient information to establish an ARfD, however, based on its proposed pattern of use the dietary intake is likely to be low.
Buprofezin	0.5	50	31 October 2006	Developmental rabbit study; a NOAEL of 50 mg/kg bw/d was based on bodyweight loss at the next higher dose.	
Butafenacil			19 November 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Captan	0.1	10	18 May 2007	Developmental rabbit study; a NOAEL of 10 mg/kg bw/d was based on reduced maternal body weight and increased skeletal variations in foetuses at the next higher dose.	ARfD for captan only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

Carbaryl	0.01	1	13 December 2002	Subchronic neurotoxicity rat study; a NOAEL of 1 mg/kg bw/d was based on behavioural indications of autonomic neurotoxicity and reduced brain, plasma and RBC ChE activity at the next higher dose.	
Carbendazim	0.05	50 [LOAEL]	15 February 2011	Special acute study in male rats; based on significant testicular and efferent ductal alterations at 50 mg/kg bw, the lowest dose tested.	The ARfD is also supported by an acute in vivo genotoxicity study, with increased frequencies of micronuclei were observed in spermatids at a LOAEL of 50 mg/kg bw.
Carbetamide	0.3	30	1 October 2020	90-day and 1-year dog studies; a NOAEL of 30 mg/kg bw/d was based on the observation of clinical signs of neurotoxicity including unsteady gait, drowsiness and tremor which were manifest early in the studies and may occur after acute exposures.	
Ceftiofur (as free acids and salts)			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Cephalexin			22 November 2000		ARfD is considered to be unnecessary; therapeutic dose for adults ranges between 1–4 g/day.
Cetrimide			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Chlorantraniliprole			9 May 2008		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Chlorfenvinphos	0.02	1.9	5 December 2000	14-day mouse study; a NOAEL of 1.9 mg/kg bw/d was based on inhibition of RBC ChE activity at the next higher dose.	
Chlormequat	0.07	7.5	23 June 2005	2-year dietary dog study; a NOAEL of 7.5 mg/kg bw/d was based on excessive salivation and muscle weakness observed after a single dose.	
Chloropicrin			16 January 2014		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Chlorpyrifos	0.03	1	June 2019	Based on the no observed effect level of 1 mg/kg bw for inhibition of erythrocyte (acetyl) cholinesterase human males and incorporates a total uncertainty factor of 30.	Selected NOAEL is sufficiently protective against inhibition of brain cholinesterase and other effects of chlorpyrifos. (APVMA reconsideration of chlorpyrifos - toxicology update - June 2019)
Cinmethylin	0.3	30	20 August 2003	Developmental rat study; a NOAEL of 30 mg/kg bw/d was based on clinical signs (excess salivation and urine stained abdominal fur) at the next higher dose.	
Clethodim			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Clofentezine			31 December 2019		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Clitoria ternatea			23 November 2015		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
d-Cloprostenol			21 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Cloquintocet acid			5 July 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Clothianidin	0.2	25	1 August 2003	Acute neurotoxicity mouse study; a NOAEL of 25 mg/kg bw was based on clinical signs (reduced spontaneous activity) at the next higher dose.	
Codling Moth Granulosis Virus			25 November 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Cyantraniliprole			21 January 2013		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Cyazofamid			6 June 2013		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Cyclaniliprole			29 February 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Cyflufenamid			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Cyflumetofen			31 January 2022		ARfD is considered to be unnecessary due to its low oral toxicity and the absence of any neurological effects or developmental toxicity after a single dose.
Cyhalofop-butyl			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
gamma-Cyhalothrin	0.005	0.5	12 August 2003	Developmental rat study; a NOAEL of 0.5 mg/kg bw/d was based on clinical signs of toxicity, reduced body weight gains and food consumption observed in dams at the next higher dose.	

beta-Cypermethrin	0.05	4.7	19 March 2002	3-month feeding dog study; a NOAEL of 4.7 mg/kg bw/d was based on clinical signs (whole body tremors, head nodding, 'lip-licking', subduedness, ataxia, agitation and a high-stepping gait) at the next higher dose.	

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Decoquinate			4 June 2013		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Derquantel	0.01	1	27 May 2011	Acute neurotoxicity dog study; a NOAEL of 1 mg/kg bw was based on clinical signs (mydriasis, ptosis, dry eyes) at the next higher dose.	
Dexamethasone			10 October 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Diazinon	0.01	0.2	20 December 2002	Acute dose human volunteer study; a NOAEL of 0.2 mg/kg bw was based on RBC ChE inhibition at the next higher dose.	

2,6 dichlorobenzamide (BAM)	0.6	60	26 November 2015	Developmental rat study; a NOAEL of 60 mg/kg bw/d was based on increased incidence of skeletal defects of the vertebrae and sternebrae at the next higher dose.	ARfD for 2,6 dichlorobenzamide (BAM) applies to the general population.
2,4-dichlorophenoxyacetic acid (2,4-D)	0.8	75	12 September 2006	Acute neurotoxicity rat study; a NOAEL of 75 mg/kg bw was based on gait/coordination effects and decreased motor activity at the next higher dose.	
Dichlorprop-P			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Dichlorvos	0.1	1	6 April 2004	Single oral dose human volunteer study; a NOAEL of 1 mg/kg bw was based on the absence of any reduction in RBC ChE activity at 1 mg/kg bw, the only dose tested.	
Diclazuril			7 October 2021		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any neurological effects or developmental toxicity after a single dose.
Difethialone	0.0005	0.48 [LOAEL]	17 April 2007	Acute oral rat study; a LOAEL of 0.48 mg/kg bw was based on death.	
Diflufenican			May 2020		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose

Dimethenamid-P	0.25	25	12 August 03	Developmental rat study; a NOAEL of 25 mg/kg bw/d was based on signs of toxicity in the foetus (reduced bodyweight and incomplete ossification) at the next higher dose.	ARfD for dimethenamid-P only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary. Note: Dimethenamid-P, the S-isomer, and its racemic mixture have equivalent toxicity at similar dose levels.
Dimethoate	0.02	0.2	23 November 2010	Human volunteer study; a NOAEL of 0.2 mg/kg bw/d was based on ChE inhibition in whole blood at the next higher dose.	
Dimethomorph			17 April 2020		ARfD considered unnecessary due to its low oral toxicity and the absence of any neurological effects or developmental toxicity after a single dose
Dinotefuran	1.25	125	10 August 2015	Developmental rabbit study; a NOAEL of 125 mg/kg bw/d was based on reduced body weight gain at the next higher dose.	
Diphenylamine			21 April 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose. (JMPR 1998).
Diquat	0.8	75	8 February 2018	Acute neurotoxicity rat study; a NOAEL of 75 mg/kg bw was based on clinical signs, inappetence and reduced bodyweight gain at the next higher dose.	

Diuron			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Doramectin	0.02	1.5	14 October 2002	Developmental rabbit study; a NOAEL of 1.5 mg/kg bw/d was based on maternal toxicity with major malformations (cleft palate, phocomelia, syndactyly and coelosomia) observed in fetuses at 3 mg/kg bw/d and delayed ossification observed at 1.5 and 3 mg/kg bw/d.	ARfD for doramectin only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Emamectin benzoate	0.03	5	11 December 2018	Based on acute neurotoxicity in rats (tremors, irritability) at 10 mg/kg bw. Neurobehavioral effects were accompanied by serious histopathological observations of neuronal degeneration in brain and spinal cord as well as effects on sciatic nerves at 25 mg/kg bw.	JMPR 2011 Uncertainty factors applied were 10 for interspecies uncertainties, 10 for intraspecies uncertainties and 2 for severity of effect due to the serious neuropathological effects at 25 mg/kg bw.

Enterococcus faecium			4 September 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Epoxiconazole	0.2	20	16 April 2002	Developmental rabbit study; a NOAEL of 20 mg/kg bw/d was based on increased incidence of resorptions at the next higher dose.	ARfD for epoxiconazole only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Eprinomectin	0.2	1.5	31 January 2018	Human clinical trial; absence of any effects at the highest tested dose of 1.5 mg/kg bw.	ARfD was based on a clinical trial with ivermectin using a 'read across' approach due to the structural similarity and pharmacokinetic similarities of the two avermectin analogues.
Esfenvalerate	0.02	1.75	31 January 2018	Acute neurotoxicity rat study; a NOAEL of 1.75 mg/kg bw was based on clinical signs of neurotoxicity (tremors) at the next higher dose.	
Ethametsulfuron-methyl			17 January 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Ethoxyquin	0.5	50	21 February 2000	Acute oral (capsule) dog study; a NOAEL of 50 mg/kg bw for effects on the hepatic biliary system and clinical signs at the next higher dose.	ARfD for ethoxyquin is based on JMPR evaluation (2005). The ARfD which is applicable for the general population includes three residues (MEQ, DHMEQ and DHEQ).
Ethoxysulfuron			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Ethyl formate			26 November 2003		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Etofenprox	1	100	4 December 2017	Developmental rabbit studies; an overall NOAEL of 100 mg/kg bw/d in two studies was based on reduced maternal bodyweight and food consumption immediately after dosing and an increased incidence of post-implantation loss at the next higher dose. (JMPR 2011, EFSA 2009).	ARfD for etofenprox only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Etoxazole			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Eugenol			19 August 2020		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Fenamiphos	0.003	0.25	7 November 2005	Acute oral dog study; a NOAEL of 0.25 mg/kg bw was based on inhibition of RBC ChE activity at the next higher dose.	

Fenbuconazole			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Fenhexamid			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Fenitrothion	0.03	0.33	5 December 2000	Acute single dose human volunteer study; a NOAEL of 0.33 mg/kg bw was based on the absence of any inhibition of plasma and RBC ChE activity at the highest tested dose.	
Fenpyrazamine	0.8	80	15 February 2017	Acute neurotoxicity rat study; a NOAEL of 80 mg/kg bw was based on a reduction in motor activity and number of rearings at the next higher dose.	
Fipronil	0.02	2.5	19 June 2006	Two acute oral neurotoxicity rat studies; a NOAEL of 2.5 mg/kg bw was based on reduced footsplay at the next higher dose.	This is a group ARfD value which includes fipronil, desulfinyl fipronil, fipronil sulphide and fipronil sulphone.
Flazasulfuron			26 September 2011		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Flonicamid			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Florasulam			26 May 2009		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Florfenicol			4 January 2001		ARfD considered unnecessary due to its low oral toxicity after a single dose; structural analogs of florfenicol have a long history of therapeutic use without acute effects.
Florpyrauxifen-benzyl			8 August 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Florylpicoxamid			16 February 2022		ARfD considered to be unnecessary on the basis of its low acute toxicity, the lack of evidence for any acute neurotoxicity and the absence of any other toxicologically relevant effect that might be attributable to a single dose.
Flubendiamide			14 December 2007		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Fludioxonil			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Fluensulfone	0.15	16.2	12 June 2014	2-Gen reproduction study; a NOAEL of 16.2 mg/kg bw/d based on post-natal loss of pups at the next higher dose.	ARfD for fluensulfone applies to the general population.

Flufenoxuron			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Flumethrin			4 September 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Flumiclorac pentyl			8 December 2004		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Flumioxazin	0.03	3	12 December 2002	Developmental rat study; a NOAEL of 3 mg/kg bw/d was based on embryo/foetal developmental toxicity with increased incidences of cardiovascular abnormalities at the next higher dose.	ARfD for flumioxazin only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Flunixin meglumine	0.02	2	1 August 2002	6-week rat study; a NOAEL of 2 mg/kg bw/d was based clinical signs (reduced activity) at the next higher dose.	
Fluopicolide	0.6	60	26 November 2015	Developmental rat study; a NOAEL of 60 mg/kg bw/d was based on increased incidence of skeletal defects of the vertebrae and sternebrae at the next higher dose.	ARfD for fluopicolide only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Fluopyram	0.5	50	6 July 2015	Acute neurotoxicity rat study; a NOAEL of 50 mg/kg bw/d was based on slightly lower motor and locomotor activity at the next higher dose.	

Fluopxapiprolin					ARfD considered unnecessary, based on the absence of any toxic effects in laboratory animals observed after a single dose.
Flupyradifurone	0.35	35	11 August 2015	Acute neurotoxicity rat study; a NOAEL of 35 mg/kg bw was based on increased incidences of piloerection and increased incidences of pupil dilation at the next higher dose.	
Fluralaner			31 May 2018	ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.	
Flutolanil			28 August 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Fluxapyroxad			20 March 2020		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Formesafen	1	100	29 March 2021	Rat acute neurotoxicity study; a NOAEL of 100 mg/kg bw/day based on potential acute neurotoxicity at the next higher dose	

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments

Geraniol			19 August 2020		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Glufosinate ammonium			28 August 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Glyphosate			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Halauxifen-methyl			17 September 2014		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Halofuginone	0.0003	0.025	16 June 2006	Developmental rabbit study; a NOAEL of 0.025 mg/kg bw/d was based on reduced body weight gain and food consumption, mortality and abortions at the next higher dose.	ARfD for halofuginone only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Halsulfuron-methyl	0.5	50	4 February 2022	Developmental rabbit study; a NOAEL of 50 mg/kg bw/d was based on increased number of resorptions (total and per dam and increased post-implantation loss) at the next higher dose.	

Hexaflumuron			31 August 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Hexythiazox			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Imazalil	0.05	5	29 January 2007	Developmental rabbit study; a NOAEL of 0.05 mg/kg bw/d was based on increased number of resorptions and a reduced number of live pups at the next higher dose.	ARfD for imazalil only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Imazapic			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Imazapyr			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Imazethapyr			2 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Indoxacarb (S-Isomer) + R-Isomer	0.1	12.5	30 May 2008	Acute neurotoxicity rat study; a NOAEL of 12.5 mg/kg bw was based on reduced bodyweight gain and food consumption at the next higher dose.	
Ipconazole			18 January 2010		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Isocycloseram	0.08	7.5	18 November 2021	Developmental rat study: a NOAEL of 7.5 mg/kg bw was based on an increased incidence of bifid sternum, which might be attributable to a single exposure at the next higher dose.	
Isofetamid	3	300	9 March 2017	Developmental rabbit study; a NOAEL of 300 mg/kg bw/d is based on reduced maternal bodyweight gain early in gestation at the next higher dose.	
Isopyrazam	0.3	30	24 May 2016	Rat acute neurotoxicity study; a NOAEL of 30 mg/kg bw was based on clinical signs of toxicity (weak appearance and decreased activity).	
Isotianil					ARfD considered to be unnecessary due to its low acute toxicity, the lack of evidence for any acute neurotoxicity and the absence of any other toxicologically relevant effect that might be attributable to a single dose.

Isoxaflutole			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Ivermectin	0.2	1.5	31 January 2018	Human clinical trial; absence of any effects at the highest tested dose of 1.5 mg/kg bw.	

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No results.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Kresoxim-methyl			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Ketoprofen	0.001	0.1	8 December 2000	Acute pharmacological rabbit study; a NOAEL of 0.1 mg/kg bw was based on inhibition of platelet aggregation at the next higher dose.	

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments

Lactobacillus acidophilus			4 September 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Lactobacillus brevis			4 September 2002		ARfD unnecessary. Naturally occurring organism– from naturally occurring background levels of the organism.
Lactobacillus casei			4 September 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Lactobacillus plantarum			4 September 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Lasalocid			19 April 2021		ARfD considered to be unnecessary due to the absence of any neurological effects or development toxicity after a single dose.
Lignocaine			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
d-limonene			4 May 2021		ARfD unnecessary. Naturally occurring compound that is also a food additive - residues from its use are unlikely to be distinguishable from naturally occurring background levels.

Lufenuron			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Maldison	1.5	15	12 April 2005	Acute oral human study; a NOAEL of 15 mg/kg bw was based on inhibition of RBC and plasma ChE activity at the higher dose.	
Mandestrobin			30 March 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Mandipropamid			9 April 2010		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Mecoprop	0.5	50	17 January 2001	Developmental rat study; a NOAEL of 50 mg/kg bw/d was based on embryolethality and foetotoxicity (lower bodyweight and shorter CR length) at the next higher dose.	ARfD for mecoprop only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

Mecoprop-p (salts and esters)	0.5	50	25 August 2021	Developmental rat study; a NOAEL of 50 mg/kg bw/d was based on embryolethality and foetotoxicity (lower bodyweight and shorter CR length) at the next higher dose.	ARfD for mecoprop-p only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary. ARfD for mecoprop-p only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary. Mecoprop-P (salts and esters) is defined as: The sum of mecoprop-P ((S)-2-(4-chloro-o-tolyloxy)propionic acid), HMCPP ((2S)-2-[4-chloro-2-(hydroxymethyl)phenoxy]propanoic acid; free and conjugated), CCPP (2-[(1S)-1-carboxyethoxy]-5-chlorobenzoic acid) and 4-glucosyl-MPP ((2S)-2-[4-(D-glucopyranosyloxy)-2-methylphenoxy]propanoic acid) expressed as mecoprop-P free acid.
Mefentrifluconazole			27 November 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Melaleuca Oil	10	1,000	12 August 2010	Based on an in vivo micronucleus study in mice using a default safety factor of 100.	
Meloxicam	0.004	0.04	4 August 2004	Human clinical trial; a pharmacological NOAEL of 0.04 mg/kg bw/d was based on increased blood pressure, pulse rate and ECG at higher doses.	
Mesosulfuron-methyl			18 January 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Mesotrione			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Metalaxyl			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Metamitron	0.1	10	4 December 2017	Developmental rat study; a NOAEL of 10 mg/kg bw/d was based on the observation that acute CNS effects, in particular sedation and lower transient body temperature, occurred at doses in excess of 10 mg/kg bw. The only identified NOAEL of 10 mg/kg bw/d in the toxicological database was observed in a rat developmental study for reduced bodyweight gain. This NOAEL was selected as the basis of the numerical ARfD (EFSA, 2008).	ARfD for metmitron applies to the general population.
Metazachlor			15 July 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Metcamifen	0.3	30	21 July 2020	Developmental rabbit study; a NOAEL of 30 mg/kg bw/d was based on increased incidence of skeletal and cartilage variants of the vertebrae and ribs, which might be attributable to a single exposure to metcamifen at higher doses.	ARfD for metcamifen only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Methamidophos	0.003	0.3	30 January 2004	Acute neurotoxicity rat study; a NOAEL of 0.3 mg/kg bw was based on plasma, RBC and brain ChE inhibition at the next higher dose.	
Methidathion	0.01	1	31 May 2004	Acute neurotoxicity rat study; a NOAEL of 1 mg/kg bw was based on RBC and brain ChE inhibition at the next higher dose.	
Methiocarb	0.005	0.5	4 December 2017	Developmental rat study; a NOAEL of 0.5 mg/kg bw/d was based on clinical signs (muscle fasciculation's) at the next higher dose.	ARfD for methiocarb applies to the general population.
Methomyl	0.02	0.1(H)	5 March 2007	Acute (capsule) human toxicity study; a NOAEL 0.1 mg/kg bw was based on erythrocyte ChE inhibition at the next higher dose.	Source; JMPR 2001.

Methoprene			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Methoxyfenozide			12 January 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
1-Methylcyclopropene			10 October 2003		There was insufficient information to establish an ARfD, however, based on its proposed pattern of use the dietary intake is likely to be low.
Metrafenone			13 April 2010		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Metribuzin			18 January 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Mevinphos	0.003	0.025	5 December 2000	28-day human volunteer study; a NOAEL of 0.025 mg/kg bw/d was based on inhibition of RBC ChE activity and clinical signs at the next higher dose.	
Milbemectin	0.06	6	29 April 2005	Developmental rat study; a NOAEL of 6 mg/kg bw/d was based on reduced maternal bodyweight gain at the next higher dose.	ARfD for milbemectin only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

Molinate	0.002	1.8 [LOAEL]	25 February 2022	Rat development neurotoxicity study; a LOAEL of 1.8 mg/kg bw based on the lowest relevant point of departure.	A total safety factor of 1000 is applied (10 for extrapolation from the LOAEL to the NOAEL, 10 for interspecies extrapolation and 10 for intraspecies extrapolation).
Monepantel			31 August 2009		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Moxidectin	0.01	1	28 March 2002	28-day dietary dog study and developmental rabbit study; a NOAEL of 1 mg/kg bw/d was based on neurotoxicity at the next higher dose (in dogs); and maternal toxicity (reduced weight gain) at the next higher dose (in rabbits).	

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Nicarbazin			19 April 2021		ARfD considered to be unnecessary due to the absence of any neurological effects or developmental toxicity after a single dose.
Niclosamide			20 September 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Novaluron			17 January 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Nuclear polyhedrosis virus of helicoverpa armigera occlusion bodies			17 December 2003		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Omethoate	0.003	0.25	20 October 2005	Acute neurotoxicity rat study; a NOAEL of 0.25 mg/kg bw was based on plasma ChE inhibition at the next higher dose.	
O-phenylphenol (see 2-phenylphenol)					
Oxathiapiprolin			30 July 2015		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Oxytetracycline			10 October.2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Paraquat	0.004	0.45	27 June 2003	1-year chronic feeding dog study; a NOAEL of 0.45 mg/kg bw/d was based on the likelihood that the observed pulmonary lesions would also occur after an acute exposure at the next higher dose.	
Penflufen	0.5	50	10 October 2012	Acute neurotoxicity rat study; a NOAEL of 50 mg/kg bw was based on decreased motor and locomotor activity at the next higher dose.	
Phenmedipham			13 April 2011		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
2-Phenylphenol			31 July 2003		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose. (JMPR 1999).
Penthiopyrad	1	125	10 February 17	Acute oral neurotoxicity rat study; a NOAEL of 125 mg/kg bw was based on clinical signs (decreased motor activity, decreased body temp, hunched position and unsteady gait) at the next higher dose.	

Pinoxaden	0.3	30	29 August 2005	Developmental toxicity rabbit study; a NOAEL of 30 mg/kg bw/d was based on early resorption, implantation loss, lower number of live births and reduced foetal weight at the next higher dose.	ARfD for pinoxaden only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Piperonyl butoxide			17 February 2020		ARfD considered unnecessary, due to its low oral toxicity and the absence of any neurological effects or developmental toxicity after a single dose.
Polyoxin D zinc salt			8 June 2021		ARfD considered unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Porcine gonadotrophins			25 June 2002		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Procymidone	0.1	12.5	10 May 2017	Developmental toxicity rat study; a NOAEL of 12.5 mg/kg bw/d was based on an increased incidence of hypospadias at the next higher dose.	ARfD for procymidone only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Prodiamine			13 October 2021		ARfD for prodiamine is not considered necessary due to its low acute oral toxicity and lack of neurological and development effects after a single dose.
Profoxydim			29 November 2006		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Prohexadione-calcium			18 January 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Propamocarb	2	200	26 November 2015	Acute neurotoxicity rat study; a NOAEL of 200 mg/kg bw was based on a reduced activity 1 h after dosing at the next higher dose.	
Propargite			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Propiconazole	0.3	30	30 August 2018	An ARfD of 0.3mg/kg bw was established based on a NOAEL of 30mg/kg bw per day in a developmental toxicity study in rats and a 100-fold safety factor. The NOAEL was identified on the basis of slight increases in rudimentary ribs and unossified sternebrae at 90mg/kg bw per day. This provides an adequate margin over the maternal toxicity and cleft palate seen at 300mg/kg bw per day. The NOAEL is also adequately protective against any acute local effects on the gastrointestinal tract based on the available data in dogs. Ataxia has also been noted in pregnant rats dosed at 360 mg/kg body weight/day.	

Propineb	0.003	0.32	22 February 2017	Developmental rat study; a NOAEL of 0.32 mg/kg bw/d was based on skeletal variations at the next higher dose.	This group ARfD value which includes propineb and propylene thiourea (PTU) only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Propylene oxide	0.4	205	21 April 2006	Inhalation developmental toxicity rat study; a NOAEC of 300 ppm (equivalent to NOAEL of 205 mg/kg bw/d) was based on increased incidence of 7th cervical rib at the next higher dose.	ARfD for propylene oxide only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Propylene thiourea (PTU)	0.003	0.32	22 February 2017		See group ARfD for propineb.
Propyzamide	0.13	40 [LOAEL]	11 December 2018	Based on a LOAEL of 40 mg/kg bw due to acute, reversible neurotoxicity (increased landing foot splay and decreased motor activity; without detectable neuropathology) in rats at this dose.	The total uncertainty factor applied is 3 for LOAEL to NOAEL extrapolation uncertainties, 10 for interspecies uncertainties and 10 for intraspecies uncertainties.
Proquinazid	1	100	10 February 2017	Acute neurotoxicity rat study; a NOAEL of 100 mg/kg bw was based on reduced motor activity at the next higher dose.	
Prosulfocarb	0.4	40	30 July 2007	Acute neurotoxicity rat study; a NOAEL of 40 mg/kg bw was based on reduced motor activity at the next higher dose.	

Prothioconazole	0.03	3	28 May 2008	Developmental rat study; a NOAEL of 3 mg/kg bw/d was based on increased incidence of 14th rib, increased resorptions and cleft palate at the next higher dose.	ARfD for prothioconazole only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary. Since the residue definition for risk assessment in all commodities is expressed as prothioconazole-desthio and this metabolite is of higher toxicity than the parent, a group ARfD was established to include prothioconazole-desthio.
Pydiflumetofen			21 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Pyraclostrobin	0.05	5	26 June 2008	Developmental rabbit study; a NOAEL of 5 mg/kg bw/d was based on early resorptions at the next higher dose.	ARfD for pyraclostrobin only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Pyraflufen-ethyl	0.2	20	17 December 2004	Developmental rabbit study; a NOAEL of 20 mg/kg bw/d was based on increased maternal mortality and morbidity at the next higher dose.	
Pyrasulfotole	0.2	200 [LOAEL]	20 August 2008	Acute neurotoxicity rat study; based on decreased motor and locomotor activity at a LOAEL of 200 mg/kg bw.	
Pyrethrins	0.2	20	31 July 2003	Acute neurotoxicity rat study; a NOAEL of 20 mg/kg bw was based on neurotoxicity observed at the next higher dose.	Adopted from JMPR 1999.

Pyridalyl			29 April 2004		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Pyridate	2	177	12 June 2020	Based on an acute neurotoxicity study in rats. Death occurred within 1 day after dosing at the next higher dose of 500 mg/kg bw.	The ARfD applies to pyridate, pyridafol and pyridafol-N-glucoside expressed as pyridate. Adopted from JMPR 2019.
Pyrimethanil			10 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Pyriofenone			26 November 2014		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Pyroxasulfone			27 June 2013		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Pyroxsulam			14 April 2008		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments

Quinclorac	2	200	13 September 2004	Acute oral toxicity gavage mouse study; a NOAEL of 200 mg/kg bw was based on clinical signs at the next higher dose.	
Quinoxyfen			15 January 2002		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Ractopamine hydrochloride	0.001	0.13	30 July 2002	Human study; a NOAEL of 0.13 mg/kg bw was based on increased heart rate at the next higher dose.	

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Saccharomyces cerevisiae			4 September 2002		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.

Saflufenacil	0.05	5	13 February 2017	Developmental rat study; a NOAEL of 5 mg/kg bw/d was based on an increased incidence of bent scapula and wavy ribs in the absence of maternal toxicity at the next higher dose.	ARfD for saflufenacil only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Sedaxane			24 April 2011		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Spinetoram			5 May 2008		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Spinosad			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Spirotetramat	1	100	26 May 2008	Acute neurotoxicity rat study; a NOAEL of 100 mg/kg bw was based on clinical signs and decreased motor activity at the next higher dose.	
Spiroxamine	0.2	20	2 July 2001	Acute neurotoxicity rat study; a NOAEL of 20 mg/kg bw was based on decrease in landing footsplay at the next higher dose.	

Streptomyces lydicus			7 June 2016		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Sulfoxaflor	0.25	25	27 June 2013	Acute oral neurotoxicity rat study; a NOAEL of 25 mg/kg bw was based on decreased motor activity at the next higher dose.	
Sulfuryl Fluoride	0.3	31	24 August 2006	Acute inhalational neurotoxicity rat study; a NOAEL of 31 mg/kg bw (300 ppm) was based on the absence of any observed effects at the highest tested concentration of 300 ppm.	

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments

Tebuconazole	0.3	30	11 December 2018	Based on a maternal and developmental toxicity NOAEL of 30 mg/kg bw/day in rats and rabbits. Maternotoxicity manifested as decreased body weight gain. Visceral and skeletal developmental anomalies occurred at higher doses. This is supported by a NOAEL of 30 mg/kg bw/day in the 28-day oral (gavage) toxicity study in rats based on changes in haematological parameters detected at the next highest dose. The haematological changes could potentially be caused by a single dose.	Total uncertainty factor applied was 100.
Tepraloxydim			13 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Terbuthylazine			4 May 2001		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Tetraconazole	0.2	16	12 December 2002	4-week dietary rat study; a NOAEL of 16 mg/kg bw/d was based on clinical signs at the next higher dose.	
Tetraniliprole			17 July 2019		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose .

Thiacloprid	0.03	3.1	20 July 2001	Acute oral neurotoxicity rat study; a NOAEL of 3.1 mg/kg bw was based on reduced motor & locomotor activity at the next higher dose.	
Thiram	0.1	10	2 July 2010	Acute neurotoxicity rat study; a NOAEL of 10 mg/kg bw was based on reduced locomotor activity at the next higher dose.	
Thymol			19 August 2020		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Tiafenacil	0.006	0.6	22 December 2020	One-generation rat reproductive study. A NOAEL of 0.6 mg/kg bw/d was based on increased total liver porphyrins at the next higher dose.	
Tilmicosin	0.4	36	29 August 2002	7-day oral dosing (capsule) dog study; a NOAEL of 10 mg/kg bw/d was based on the absence of clinical signs (ataxia, dyspnoea, bilateral mydriasis) during the first 4 days of dosing.	
Tolfenamic acid	0.005	[0.5]	16 January 2001	Lowest effective therapeutic dose (as a single dose) for treatment of pyresis in children.	
Toltrazuril	0.02	2	26 March 2020	Rabbit developmental studies; an overall NOAEL of 2 mg/kg bw/d with foetotoxicity at the next higher dose.	

Topramezone			16 June 2016		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Trifloxystrobin			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Trifloxysulfuron			13 February 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Trifludimoxazin			28 May 2020		An ARfD was considered unnecessary due to its low oral toxicity and the absence of any neurological effects or developmental toxicity after a single dose.
Trinexapac-ethyl			10 May 2017		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Tulathromycin	0.1	100	16 August 2006	Acute tolerance dog study; a LOAEL of 100 mg/kg bw was based on the occurrence of emesis and loose stools.	

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments

Ulocladium oudemansii			12 December 2003		ARfD unnecessary. Naturally occurring organism– residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.

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No results.

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No results.

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No results.

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No results.

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Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Zilpaterol	0.00004	0.00076[LOAEL]	24 October 2016	Single dose human study; a LOAEL of 0.05 mg/person (equal to 0.00076 mg/kg bw) was based on the observation of tremors at the lowest tested dose.	

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The Australian Pesticides and Veterinary Medicines Authority (APVMA) is the Australian Government regulator of agricultural and veterinary (agvet) chemical products.

We acknowledge the traditional owners and custodians of country throughout Australia and acknowledge their continuing connection to land, sea and community. We pay our respects to the people, the cultures and the elders past, present and emerging.