Australian Government
Australian Pesticides and
Veterinary Medicines Authority

Acute Reference Doses (ARfD) for Agricultural and Veterinary Chemicals Used in Food Producing Crops or Animals

Edition 2 / 2017 current as of
30 June 2017

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ISSN 1446-1412

This document includes some recommendations made by the Office of Chemical Safety (OCS).

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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 **'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).

The **'Date' column** indicates when particular ARfDs were established.

ARfD list

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
A					
Abamectin	0.005	0.5	18-Nov-03	Developmental rabbit study; a NOAEL of 0.5 mg/kg bw/d was based on foetal abnormalities (clubbed forefeet) at the next higher dose.	ARfD for abamectin only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Acetamiprid	0.1	10	27-Jul-01	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.	
Acetyl isovaleryltylosin tartrate	1.86	360	21-Aug-06	Acute oral mouse study; a NOAEL of 360 mg/kg bw was based on the clinical signs observed at the next higher dose.	
Acibenzolar-S-methyl	0.01	10 [LOAEL]	23-Apr-02	Developmental rat study; based on haemorrhagic discharge in dams at LOAEL of 10 mg/kg bw/d.	
Aldicarb	0.001	0.01	15-Dec-99	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.	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Ametoctradin			1-Feb-12		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Aminopyralid			10-Jan-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Amisulbrom			14-Jun-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Atrazine			05-Dec-00		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Aureobasidium pullulans			21-Feb-17		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	04-Jul-01	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.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Azimsulfuron			10-Jan-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Azinphos-methyl	0.075	0.75	05-Dec-00	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-Apr-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
B					
Bacillus amyloliquefaciens			09-May-02		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Bacillus licheniformis			09-May-02		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Bacillus sphaericus strain 2362			09-May-03		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-Sep-02		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-Aug-03		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Bentazone			21-Apr-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Benzylpenicillin procaine			10-Oct-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
					toxicity after a single dose.
Beta-cypermethrin	0.05	4.7	19-Mar-02	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.	
Bicyclopyrone	0.01	1	10-Jan-17	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-Jan-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Bitertanol			21-Apr-17		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-Jan-16	Developmental rat study; a NOAEL of 20 mg/kg bw/d was based on reduced body weight gain in dams and foetuses at the	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
				next higher dose.	
Boscalid			10-Jan-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Bromide			10-Oct-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Bupivacaine			17-Feb-17		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-Oct-06	Developmental rabbit study; a NOAEL of 50 mg/kg bw/d was based on bodyweight loss at the next higher dose.	
Butafenacil			19-Nov-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
C					

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Captan	0.1	10	18-May-07	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-Dec-02	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-Feb-11	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
Ceftiofur (as free acids and salts)			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Cephalexin			22-Nov-00		ARfD is considered to be unnecessary; therapeutic dose for adults ranges between 1-4 g/day.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Cetrimide			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Chlorantraniliprole			9-May-08		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Chlorfenvinphos	0.02	1.9	05-Dec-00	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-Jun-05	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-Jan-14		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Chlorpyrifos	0.1	1	05-Dec-00	Single dose human study; a NOAEL of 1 mg/kg bw/d was based on inhibition of RBC ChE activity at the next higher dose.	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Cinmethylin	0.3	30	20-Aug-03	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-17		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-Nov-15		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-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Cloquintocet acid			05-Jul-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Clothianidin	0.2	25	01-Aug-03	Acute neurotoxicity mouse study; a NOAEL of 25 mg/kg bw was based on clinical signs (reduced spontaneous activity) at the next	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
				higher dose.	
Codling Moth Granulosis Virus			25-Nov-02		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Cyantraniliprole			21-Jan-13		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Cyazofamid			6-Jun-13		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Cyclaniliprole			29-Feb-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Cyflufenamid			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Cyhalofop-butyl			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
D					
Decoquinate			4-Jun-13		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Derquantel	0.01	1	27-May-11	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-Oct-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Diazinon	0.01	0.2	20-Dec-02	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-Nov-15	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.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
2,4-dichlorophenoxyacetic acid (2,4-D)	0.8	75	12-Sep-06	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-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Dichlorvos	0.1	1	06-Apr-04	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.	
Difethialone	0.0005	0.48 [LOAEL]	17-Apr-07	Acute oral rat study; a LOAEL of 0.48 mg/kg bw was based on death.	
Dimethenamid-P	0.25	25	12-Aug-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-Nov-10	Human volunteer study; a NOAEL of 0.2 mg/kg bw/d was based on ChE inhibition in whole blood at	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
				the next higher dose.	
Dinotefuran	1.25	125	10-Aug-15	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-Apr-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose. (JMPR-98)
Diquat	0.05	26.5	28-May-02	Acute oral dog study; a NOAEL of 26.5 mg/kg bw was based on clinical signs (GIT effects) at the next higher dose.	
Diuron			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Doramectin	0.02	1.5	14-Oct-02	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	ARfD for doramectin only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
				1.5 and 3 mg/kg bw/d.	
E					
Enterococcus faecium			4-Sep-02		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-Apr-02	Developmental rat study; a NOAEL of 15 mg/kg bw/d was based on skeletal variations (rudimentary ribs) at the next higher dose. 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.
Ethametsulfuron-methyl			17-Jan-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Ethoxysulfuron			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Ethyl formate			26-Nov-03		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Etoxazole			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
F					
Fenamiphos	0.003	0.25	07-Nov-05	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-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Fenhexamid			2-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Fenitrothion	0.03	0.33	05-Dec-00	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-Feb-17	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-Jun-06	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-Sep-11		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Flonicamid			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Florasulam			26-May-09		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Florfenicol			04-Jan-01		ARfD considered unnecesary due to its low oral toxicity after a single dose; structural analogs of florfenicol have a long history of therapeutic use without acute effects.
Flubendiamide			14-Dec-07		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Fludioxonil			2-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Flufenoxuron			2-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Flumethrin			04-Sep-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Flumiclorac pentyl			08-Dec-04		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Flumioxazin	0.03	3	12-Dec-02	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	01-Aug-02	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-Nov-15	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	06-Jul-15	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.	
Flupyradifurone	0.35	35	11-Aug-15	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.	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Flutolanil			28-Aug-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Fluxapyroxad			30-Jan-12		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
G					
Gamma-cyhalothrin	0.005	0.5	12-Aug-03	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.	
Glufosinate ammonium			28-Aug-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Glyphosate			2-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
H					
Halauxifen-methyl			17-Sep-14		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Halofuginone	0.0003	0.025	16-Jun-06	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.
Hexaflumuron			31-Aug-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Hexythiazox			2-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
I					
Imazalil	0.05	5	29-Jan-07	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-17		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-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
					toxicity after a single dose.
Imazethapyr			2-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Indoxacarb	0.1	12.5	30-May-08	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-Jan-10		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Isofetamid	3	300	9-Mar-17	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-16	Rat acute neurotoxicity study; a NOAEL of 30 mg/kg bw was based on clinical signs of toxicity (weak appearance and decreased activity).	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Isoxaflutole			10-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Ivermectin	0.01	0.15	29-Jul-03	Human therapeutic study; based on dose of 0.15 mg/kg bw, at which level no teratogenicity or significant ivermectin related toxicity appear to have been observed across some millions of patients over a period of many years.	A number of studies in humans support the selection of the 0.15 mg/kg bw dose.
K					
Kresoxim-methyl			10-May-17		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-Dec-00	Acute pharmacological rabbit study; a NOAEL of 0.1 mg/kg bw was based on inhibition of platelet aggregation at the next higher dose.	
L					
Lactobacillus acidophilus			4-Sep-02		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
					organism.
Lactobacillus brevis			4-Sep-02		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Lactobacillus casei			4-Sep-02		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-Sep-02		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Lignocaine			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Lufenuron			10-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
M					
Maldison	1.5	15	12-Apr-05	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-Mar-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Mandipropamid			09-Apr-10		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Mecoprop	0.5	50	17-Jan-01	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	0.5	50	17-Jan-01	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	ARfD for mecoprop-p only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
				higher dose.	
Meloxicam	0.004	0.04	04-Aug-04	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-Jan-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Mesotrione			10-May-17		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-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Metazachlor			15-Jul-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Methamidophos	0.003	0.3	30-Jan-04	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-04	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	0.03	3	05-Dec-01	Four-week rat gavage study; a NOAEL of 3 mg/kg bw/d was based on plasma, RBC and brain ChE inhibition at the next higher dose.	
Methoprene			10-May-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Methoxyfenozide			12-Jan-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
1-Methylcyclopropene			10-Oct-03		There was insufficient information to establish an ARfD, however, based on its proposed pattern of use the dietary intake is likely to be low.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Metrafenone			13-Apr-10		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Metarhizium Anisopliae var. Acridum (isolate FI-985)			04-Sep-03		ADI unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Metribuzin			18-Jan-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Mevinphos	0.003	0.025	05-Dec-00	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-Apr-05	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.
Monepantel			31-Aug-09		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Moxidectin	0.01	1	28-Mar-02	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).	
N					
Niclosamide			20-Sep-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Novaluron			17-Jan-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Nuclear polyhedrosis virus of helicoverpa armigera occlusion bodies			17-Dec-03		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
O					
Omethoate	0.003	0.25	20-Oct-05	Acute neurotoxicity rat study; a NOAEL of 0.25 mg/kg bw was based on plasma ChE inhibition at the next higher dose.	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
O-phenylphenol (see 2-phenylphenol)					
Oxathiapiprolin			30-Jul-15		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Oxytetracycline			10-Oct-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
P					
Paraquat	0.004	0.45	27-Jun-03	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-Oct-12	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-Apr-11		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
2-Phenylphenol			31-Jul-03		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose. (JMPR'99)
Penthiopyrad	1	125	10-Feb-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 postion and unsteady gait) at the next higher dose.	
Pinoxaden	0.3	30	29-Aug-05	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.
Porcine gonadotrophins			25-Jun-02		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Procymidone	0.1	12.5	10-May-17	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.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Profoxydim			29-Nov-06		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Prohexadione-calcium			18-Jan-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Propamocarb	2	200	26-Nov-15	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-17		ARfD considered to be unnecessary due to its low oral toxicity and the absence of any developmental toxicity after a single dose.
Propineb	0.003	0.32	22-Feb-17	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.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Propylene oxide	0.4	205	21-Apr-06	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-Feb-17		See group ARfD for Propineb.
Proquinazid	1	100	10-Feb-17	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-Jul-07	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-08	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

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
					prothioconazole-desthio.
Pydiflumetofen			21-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Pyraclostrobin	0.05	5	26-Jun-08	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-Dec-04	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-Aug-08	Acute neurotoxicity rat study; based on decreased motor and locomotor activity at a LOAEL of 200 mg/kg bw.	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Pyrethrins	0.2	20	31-Jul-03	Acute neurotoxicity rat study; a NOAEL of 20 mg/kg bw was based on neurotoxicity observed at the next higher dose.	Adopted from JMPR '99.
Pyridalyl			29-Apr-04		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Pyrimethanil			10-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Pyriofenone			26-Nov-14		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Pyroxasulfone	1	100	23-Sep-11	Neurodevelopmental rat study; a NOAEL of 100 mg/kg bw/d was based on decreased brain weight, reduced hippocampus thickness, corpus callosum, and cerebellum in offspring at the next higher dose.	ARfD for pyroxasulfone only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Pyroxsulam			14-Apr-08		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Q					

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Quinclorac	2	200	13-Sep-04	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-Jan-02		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
R					
Ractopamine hydrochloride	0.001	0.13	30-Jul-02	Human study; a NOAEL of 0.13 mg/kg bw was based on increased heart rate at the next higher dose.	
S					
Saccharomyces cerevisiae			04-Sep-02		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-Feb-17	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 salflufenacil only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Spinetoram			05-May-08		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Spinosad			10-May-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Spirotetramat	1	100	26-May-08	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	02-Jul-01	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			07-Jun-16		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-Jun-13	Acute oral neurotoxicity rat study; a NOAEL of 25 mg/kg bw was based on decreased motor activity at the next higher dose.	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Sulfuryl Fluoride	0.3	31	24-Aug-06	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.	
T					
Tebuconazole			27-Aug-10		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Tepraloxydim			13-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Terbuthylazine			04-May-01		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Tetraconazole	0.2	16	12-Dec-02	4-week dietary rat study; a NOAEL of 16 mg/kg bw/d was based on clinical signs at the next higher dose.	
Thiacloprid	0.03	3.1	20-Jul-01	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.	

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Thiophanate-methyl	0.2	20	15-Feb-11	Developmental toxicity rat study; a NOAEL of 20 mg/kg bw/d was based on increase in foetal skeletal variations (supernumerary ribs, reduced lumbar vertebrae) at the next higher dose.	ARfD for thiophanate-methyl only applies to women of child-bearing age. An ARfD for the general population is considered to be unnecessary.
Thiram	0.1	10	02-Jul-10	Acute neurotoxicity rat study; a NOAEL of 10 mg/kg bw was based on reduced locomotor activity at the next higher dose.	
Tilmicosin	0.4	36	29-Aug-02	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-Jan-01	Lowest effective therapeutic dose (as a single dose) for treatment of pyresis in children.	
Topramezone			16-Jun-16		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Trifloxystrobin			10-May-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.

Chemical	ARfD (mg/kg bw)	NOAEL (mg/kg bw)	Date	Study	Comments
Trifloxysulfuron			13-Feb-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Trinexapac-ethyl			10-May-17		ARfD considered to be unnecessary due to its low oral toxicity or the absence of any developmental toxicity after a single dose.
Tulathromycin	0.1	100	16-Aug-06	Acute tolerance dog study; a LOAEL of 100 mg/kg bw was based on the occurrence of emesis and loose stools.	
U					
Ulocladium oudemansii			12-Dec-03		ARfD unnecessary. Naturally occurring organism - residues from its use are unlikely to be distinguishable from naturally occurring background levels of the organism.
Z					
Zilpaterol	0.00004	0.00076[LOAEL]	24-Oct-16	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.	