

# **STANDARD 1.4.1**

## **CONTAMINANTS AND NATURAL TOXICANTS**

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### **Purpose**

This Standard sets out the maximum levels (MLs) of specified metal and non-metal contaminants and natural toxicants in nominated foods. As a general principle, regardless of whether or not an ML exists, the levels of contaminants and natural toxicants in all foods should be kept As Low As Reasonably Achievable (the ALARA principle).

An ML has been established only where it serves an effective risk management function and only for those foods which provide a significant contribution to the total dietary exposure. Food not listed in this Standard may contain low levels of contaminants or natural toxicants. However, MLs have not been assigned to these foods because they present a low public health risk. The general provisions of the Food Acts relating to the availability of safe foods apply to all foods.

MLs have been set at levels that are consistent with public health and safety and which are reasonably achievable from sound production and natural resource management practices. Consideration has also been given to Australia's and New Zealand's international trade obligations under the World Trade Organization's Agreement on the Application of Sanitary and Phytosanitary Measures and the Agreement on Technical Barriers to Trade.

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### **Clauses**

#### **1 Interpretation**

(1) In this Standard –

**arsenic** is considered to be a metal.

**maximum level (ML)** means the maximum level of a specified contaminant, or specified natural toxicant, which is permitted to be present in a nominated food expressed, unless otherwise specified, in milligrams of the contaminant or the natural toxicant per kilogram of the food (mg/kg).

(2) Where food contains a metal and any other chemical species of that metal, all chemical species of that metal must be expressed as the metal.

(3) The maximum level must be calculated for the edible content of the food that is ordinarily consumed.

(4) The level for a food which is dried, dehydrated or concentrated is to be calculated on the basis of the mass of the food, or the mass of the ingredients of the food, prior to drying, dehydration or concentration determined from one or more of the following –

- (a) the manufacturer's analysis of the food; and
- (b) calculation from actual or average quantity in water in the ingredients used; and
- (c) generally accepted data.

(5) The level for seaweed whether dried, dehydrated, concentrated or not is to be calculated with respect to the mass of the seaweed at 85% hydration.

(6) For a mixed food, the prescribed formula for the purposes of this Standard is –

$$ML1 = \frac{(MLA \times Total A)}{Total} + \frac{(MLB \times Total B)}{Total} + \frac{CF \times (Total - (Total A + Total B))}{Total}$$

Where –

ML1 = ML which applies to the contaminant or natural toxicant in the mixed food (mg/kg)

MLA = ML for contaminant or natural toxicant in food A (mg/kg)

MLB = ML for contaminant or natural toxicant in food B (mg/kg)

Total = total weight of mixed food (g)

Total A = total weight of food A in the mixed food (g)

Total B = total weight of food B in the mixed food (g)

CF = Background Calculation Factor where, in the case of –

- (a) lead, CF = 0.01 mg/kg; and
- (b) cadmium, CF = 0.005 mg/kg; and
- (c) other contaminants, CF = 0

**Editorial note:**

It is recognised both lead and cadmium are ubiquitous in the environment and occur at low levels in foods other than those listed in this Standard. Therefore, in order to assist with the enforcement of MLs in mixed foods which may contain these contaminants, the calculation requires the inclusion of a representative contaminant level for those foods that do not have an allocated ML. In the past, an ML was set for 'all other foods'. As the category for 'all other foods' was discontinued, a representative level is selected for the contaminants cadmium and lead. These levels are set at the limit of quantification (LOQ), and are 0.01 mg/kg for lead and 0.005 mg/kg for cadmium.

The calculation for mixed food for all other contaminants with an ML will assume that the contributing commodity, e.g. peanuts in peanut sauce, contains all of the contaminant.

**2 Maximum levels of metal contaminants in food**

(1) In this clause –

**food** means the food or class of foods listed in Column 2 of the Table to this clause.

**metal contaminant** means a substance listed in Column 1 of the Table to this clause and includes compounds of a metal.

(2) The maximum levels for metal contaminants in food are listed in Column 3 of the Table to this clause.

(3) Where a mixed food contains food or a class of foods listed in Column 2 of the Table to this clause, the proportion of the metal contaminant permitted to be present in the mixed food (ML1) is calculated in accordance with the formula prescribed in subclause 1(6).

**Table to clause 2**

<b>Column 1 Contaminant</b>	<b>Column 2 Food</b>	<b>Column 3 Maximum level (mg/kg)</b>
Arsenic (total)	Cereals	1

Column 1 Contaminant	Column 2 Food	Column 3 Maximum level (mg/kg)
Arsenic (inorganic)	Crustacea Fish Molluscs Seaweed	2 2 1 1
Cadmium	Chocolate and cocoa products Kidney of cattle, sheep and pig Leafy vegetables (as specified in Schedule 4 to Standard 1.4.2) Liver of cattle, sheep and pig Meat of cattle, sheep and pig (excluding offal) Molluscs (excluding dredge/bluff oysters and queen scallops) Peanuts Rice Root and tuber vegetables (as specified in Schedule 4 to Standard 1.4.2) Wheat	0.5 2.5 0.1 1.25 0.05 2 0.5 0.1 0.1 0.1
Lead	Brassicas Cereals, Pulses and Legumes Edible offal of cattle, sheep, pig and poultry Fish Fruit Infant formulae Meat of cattle, sheep, pig and poultry (excluding offal) Molluscs Vegetables (except brassicas)	0.3 0.2 0.5 0.5 0.1 0.02 0.1 2 0.1
Mercury	Crustacea Fish (as specified in Schedule 4 to Standard 1.4.2) and fish products, excluding gemfish, billfish (including marlin), southern bluefin tuna, barramundi, ling, orange roughy, rays and all species of shark Gemfish, billfish (including marlin), southern bluefin tuna, barramundi, ling, orange roughy, rays and all species of shark Fish for which insufficient samples are available to analyse in accordance with clause 6 Molluscs	mean level of 0.5* mean level of 0.5*  mean level of 1* 1 mean level of 0.5*
Tin	All canned foods	250

\* A reference to a mean level in the Table to clause 2 in this Standard is to the mean level of mercury in the prescribed number of sample units as described in clause 6 of this Standard.

### 3 Maximum levels of non-metal contaminants in food

(1) In this clause –

**ergot** means the sclerotium or dormant winter form of the fungus, *Claviceps purpuria*.

**food** means the food or class of foods listed in Column 2 of the Table to this clause.

**MU** means the unit of measure described in *Recommended procedures for examination of seawater and shellfish*, Irwin N. (ed.) 4<sup>th</sup> Ed. 1970, American Public Health Association Inc.

**non-metal contaminant** means a substance listed in Column 1 of the Table to this clause.

(2) The maximum levels for non-metal contaminants in food are listed in Column 3 of the Table to this clause.

(3) Where a mixed food contains a food or class of foods listed in Column 2 of the Table to this clause, the proportion of the non-metal contaminant permitted to be present in the mixed food (ML1) is calculated in accordance with the formula prescribed in subclause 1(6).

**Table to clause 3**

<b>Column 1 Contaminant</b>	<b>Column 2 Food</b>	<b>Column 3 Maximum level (mg/kg unless specified otherwise)</b>
Acrylonitrile	All food	0.02
Aflatoxin	Peanuts Tree nuts (as specified in Schedule 4 to Standard 1.4.2)	0.015 0.015
Amnesic shellfish poisons (Domoic acid equivalent)	Bivalve molluscs	20
3-chloro-1,2-propanediol	Soy sauce and oyster sauce	0.2 calculated on a 40% dry matter content
Diarrhetic shellfish poisons (Okadaic acid equivalent)	Bivalve molluscs	0.2
1,3-dichloro-2-propanol	Soy sauce and oyster sauce	0.005 calculated on a 40% dry matter content
Ergot	Cereal grains	500
Methanol	Red wine, white wine and fortified wine Whisky, Rum, Gin and Vodka Other spirits, fruit wine, vegetable wine and mead	3 g of methanol per litre of ethanol 0.4 g of methanol per litre of ethanol 8 g of methanol per litre of ethanol
Neurotoxic shellfish poisons	Bivalve molluscs	200 MU/kg
Paralytic shellfish poisons (Saxitoxin equivalent)	Bivalve molluscs	0.8
Phomopsins	Lupin seeds and the products of lupin seeds	0.005
Polychlorinated biphenyls, total	Mammalian fat Poultry fat Milk and milk products Eggs Fish	0.2 0.2 0.2 0.2 0.5
Vinyl chloride	All food except packaged water	0.01

#### **4 Maximum levels of natural toxicants from the addition of flavouring substances to food**

(1) In this clause –

**food** means the food or class of foods listed in Column 2 of the Table to this clause.

**natural toxicant from the addition of a flavouring substance** means a substance listed in Column 1 of the Table to this clause.

(2) The maximum levels for natural toxicants from the addition of a flavouring substance in food are listed in Column 3 of the Table to this clause.

(3) Where a mixed food contains a food or class of foods listed in Column 2 of the Table to this clause, the proportion of the natural toxicant from the addition of a flavouring substance permitted to be present in the mixed food (ML1) is calculated in accordance with the formula prescribed in subclause 1(6).

**Table to clause 4**

<b>Column 1 Toxicant</b>	<b>Column 2 Food</b>	<b>Column 3 Maximum level (mg/kg unless specified otherwise)</b>
Agaric acid	Food containing mushrooms	100
	Alcoholic beverages	100
Aloin	Alcoholic beverages	50
Berberine	Alcoholic beverages	10
Coumarin	Alcoholic beverages	10
Hydrocyanic acid, total	Confectionery	25
	Stone fruit juices	5
	Marzipan	50
	Alcoholic beverages	1 mg per 1% alcohol content
Hypericine	Alcoholic beverages	2
Pulegone	Confectionery	350
	Beverages	250
Quassine	Alcoholic beverages	50
Quinine	Mixed alcoholic drinks not elsewhere classified	300
	Tonic drinks, bitter drinks and quinine drinks	100
	Wine based drinks and reduced alcohol wines	300
Safrole	Food containing mace and nutmeg	15
	Meat products	10
	Alcoholic beverages	5
Santonin	Alcoholic beverages	1
Sparteine	Alcoholic beverages	5
Thujones (alpha and beta)	Sage stuffing	250
	Bitters	35
	Sage flavoured foods	25
	Alcoholic beverages	10

## **5 Maximum levels of other natural toxicants in food**

(1) In this clause –

**food** means the food or class of foods listed in Column 2 of the Table to this clause.

**honey** includes comb honey.

**hydrocyanic acid, total** means all hydrocyanic acid including hydrocyanic acid evolved from linamarin, lotaustralin, acetone cyanohydrin or butanone cyanohydrin during or following enzyme hydrolysis or acid hydrolysis, expressed as milligrams of hydrocyanic acid per kilogram of ready-to-eat cassava chips.

**natural toxicant** means a substance listed in Column 1 of the Table to this clause.

**ready-to-eat cassava chips** means the product containing sweet cassava that is represented as ready for immediate consumption with no further preparation required including crisps, crackers or 'vege' crackers.

(2) The maximum levels for natural toxicants in food are listed in Column 3 of the Table to this clause.

(3) Where a mixed food contains a food or class of foods listed in Column 2 of the Table to this clause, the proportion of the natural toxicants permitted to be present in the mixed food (ML1) is calculated in accordance with the formula prescribed in subclause 1(6).

(4) Subclause 1(2) of Standard 1.1.1 does not apply to ready-to-eat cassava chips for the purposes of the Table to clause 5.

(5) Subclause 1(2) of Standard 1.1.1 does not apply to honey for the purposes of the Table to clause 5.

(6) Notwithstanding subclauses 5(2) and (3), honey that was packaged for retail sale before the commencement of the Food Standards (Proposal P1029 – Maximum Level for Tutin in Honey) Variation is taken to comply with this clause if the product otherwise complied with the Code before that variation commenced.

**Table to clause 5**

<b>Column 1 Toxicant</b>	<b>Column 2 Food</b>	<b>Column 3 Maximum level (mg/kg)</b>
Erucic acid	Edible oils	20,000
Histamine	Fish and fish products	200
Hydrocyanic acid, total	Ready-to-eat cassava chips	10
Lupin alkaloids	Lupin flour, lupin kernel flour, lupin kernel meal and lupin hulls	200
Tutin	Honey	0.7

**Editorial note:**

The New Zealand *Food (Tutin in Honey) Standard 2010* also regulates beekeepers, packers and exporters of honey in New Zealand. It provides options for demonstrating compliance with the maximum level for tutin in honey set by clause 5 of Standard 1.4.1.

**6 Sampling plan for mercury in fish, fish products, crustacea and molluscs**

(1) The methods specified in this clause are the prescribed methods for the sampling for analysis of mercury in fish, fish products, crustacea and molluscs.

(2) For the purposes of this sampling plan –

- (a) A sample must consist of a prescribed number of sample units, and a sample unit must consist of a quantity, taken from the edible portions of the fish, fish products, crustacea or molluscs, sufficient for the purposes of analysis.
  - (b) In the lot under investigation, the number of random sample units must be as detailed in paragraphs 6(3)(a) or 6(3)(b) of this Standard.
  - (c) In the case of samplings where the prescribed number of sample units are not available, 5 sample units must be taken.
- (3) The number of random sample units to be taken for the purposes of analysis is as follows –
- (a) fish, fish products, including packaged fish –
    - (i) lots up to and including 5 tonnes ... sample units from 10 fish, or 10 packages; or
    - (ii) lots over 5 tonnes, up to 10 tonnes ... sample units from 15 fish, or 15 packages; or
    - (iii) lots over 10 tonnes, up to 30 tonnes ... sample units from 20 fish, or 20 packages; or
    - (iv) lots over 30 tonnes, up to 100 tonnes ... sample units from 25 fish, or 25 packages; or
    - (v) lots over 100 tonnes, up to 200 tonnes ... sample units from 30 fish, or 30 packages; or
    - (vi) lots over 200 tonnes ... sample units from 40 fish, or 40 packages.
  - (b) crustacea, and molluscs, including packaged crustacea and molluscs –
    - (i) lots up to and including 1 tonne ... 10 sample units, or 10 packages; or
    - (ii) lots over 1 tonnes, up to 5 tonnes ... 15 sample units, or 15 packages; or
    - (iii) lots over 5 tonnes, up to 30 tonnes ... 20 sample units, or 20 packages; or
    - (iv) lots over 30 tonnes, up to 100 tonnes ... 25 sample units, or 25 packages; or
    - (v) lots over 100 tonnes ... 30 sample units, or 30 packages.
- (4) Interpretation of the Analysis –
- (a) Samples with 10 or more sample units –
    - (i) if the concentration of mercury in any of the sample units is greater than 1.0 mg/kg in the case of gemfish, billfish (including marlin), southern bluefin tuna, barramundi, ling, orange roughy, rays and all species of shark, or is greater than 0.5 mg/kg in the case of crustacea, molluscs and other fish which can be sampled in accordance with this clause the overall mean of the sample units should be examined; or
    - (ii) if the overall mean of the lot is less than or equal to 1.0 mg/kg in the case of gemfish, billfish (including marlin), southern bluefin tuna, barramundi, ling, orange roughy, rays and all species of shark, or is less than or equal to 0.5 mg/kg in the case of crustacea, molluscs, and other fish which can be sampled in accordance with this clause and there are no individual sample units within the lot having a mercury concentration exceeding 1.5 mg/kg, the lot must be reported as complying with the standard.
  - (b) Samples with 5 sample units –

- (i) if the overall concentration of mercury in the sample is less than or equal to 1.0 mg/kg in the case of gemfish, billfish (including marlin), southern bluefin tuna, barramundi, ling, orange roughy, rays and all species of shark, or is less than or equal to 0.5 mg/kg in the case of crustacea, molluscs and other fish which can be sampled in accordance with this clause and minced fish products, the lot must be reported as complying with the standard.
- (c) Notwithstanding subclause 1(4), the mercury content of dried or partially dried fish must be calculated on an 80% moisture basis.



## Amendment History

The Amendment History provides information about each amendment to the Standard. The information includes commencement or cessation information for relevant amendments.

These amendments are made under section 92 of the *Food Standards Australia New Zealand Act 1991* unless otherwise indicated. Amendments do not have a specific date for cessation unless indicated as such.

### About this compilation

This is a compilation of Standard 1.4.1 as in force on **15 January 2015** (up to Amendment No. 152). It includes any commenced amendment affecting the compilation to that date.

Prepared by Food Standards Australia New Zealand on **15 January 2015**.

### Uncommenced amendments or provisions ceasing to have effect

To assist stakeholders, the effect of any uncommenced amendments or provisions which will cease to have effect, may be reflected in the Standard as shaded boxed text with the relevant commencement or cessation date. These amendments will be reflected in a compilation registered on the Federal Register of Legislative Instruments including or omitting those amendments and provided in the Amendment History once the date is passed.

The following abbreviations may be used in the table below:

ad = added or inserted	am = amended
exp = expired or ceased to have effect	rep = repealed
rs = repealed and substituted	

**Standard 1.4.1** was published in the *Commonwealth of Australia Gazette* No. P 30 on 20 December 2000 as part of Amendment 53 (F2008B00618 — 30 September 2008) and has since been amended as follows:

Clause affected	A'ment No.	FRLI registration Gazette	Commencement (Cessation)	How affected	Description of amendment
Standard	111	F2009L03145 13 Aug 2009 FSC53 13 Aug 2009	13 Aug 2009	am	Typographical error for references to 'Column'.
Purpose	78	F2005L01246 26 May 2005 FSC20 26 May 2005	26 May 2005	am	Typographical errors in second paragraph.
Purpose	103	F2008L03741 9 Oct 2008 FSC45 9 Oct 2008	9 Oct 2008	am	Reference to user guide.
Purpose	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	am, rep	References to WTO Agreements and user guide.
Purpose	135	F2012L02014 10 Oct 2012 FSC77 11 Oct 2012	11 Oct 2012	am	Grammatical errors.

Clause affected	A'ment No.	FRLI registration Gazette	Commencement (Cessation)	How affected	Description of amendment
Table of Provs	111	F2009L03145 13 Aug 2009 FSC53 13 Aug 2009	13 Aug 2009	am	Reference to clause 6.
1	109	F2009L02295 18 June 2009 FSC51 18 June 2009	18 June 2009	rs	Editorial note after the clause.
1(5)	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rep	Reference to edible kelp.
1(6)	111	F2009L03145 13 Aug 2009 FSC53 13 Aug 2009	13 Aug 2009	rs	Subclause to amend formula to clarify its meaning.
2(1), (2), (3)	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs	Definitions of 'food', and 'metal contaminant' and consequential amendments.
Table to clause 2	105	F2009L00076 15 Jan 2009 FSC47 15 Jan 2009	15 Jan 2009	rs	Entry for cadmium in peanuts.
Table to clause 2	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs	Table.
3(1), (2), (3)	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs	Definitions of 'food' and 'non-metal contaminant' and consequential amendments.
Table to clause 3	57	F2008B00795 10 Dec 2008 P27 1 Nov 2001	1 Nov 2001	ad	References to 3-chloro-1,2-propanediol and 1,3-dichloro-2-propanol in soy and oyster sauce.
Table to clause 3	60	F2008B00798 19 Dec 2008 FSC2 20 June 2002	20 June 2002	am	References to 'mollusc'.
Table to clause 3	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs	Table.
Table to clause 3	139	F2013L00248 21 Feb 2013 FSC81 21 Feb 2013	21 Feb 2013	rs	Entry for vinyl chloride.
4	60	F2008B00798 19 Dec 2008 FSC2 20 June 2002	20 June 2002	rs	Definitions of 'food' and 'natural toxicant from the addition of a flavouring substance'.
4(1), 92), (3)	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs	Definitions of 'food' and 'natural toxicant from the addition of a flavouring substance' and consequential amendments.
Table to clause 4	62	F2008B00807 19 Dec 2008 FSC4 17 Sept 2002	17 Sept 2002	ad	Entry for Quinine.
Table to clause 4	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs	Table.

Clause affected	A'ment No.	FRLI registration Gazette	Commencement (Cessation)	How affected	Description of amendment
5	107	F2009L01618 30 April 2009 FSC49 30 April 2009	30 April 2009	ad	Definitions of 'hydrocyanic acid' and 'ready-to-eat cassava chips' and consequential amendments.
5(1), (2), (3)	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs, am	Definitions of 'food' and 'natural toxicant' and consequential amendments.
5(1)	152	F2015L00037 14 Jan 2015 FSC94 15 Jan 2015	15 Jan 2015	ad	References to 'chemical'.
5(5)	121	F2011L00213 9 Feb 2011 FSC63 10 Feb 2011	10 Feb 2011	ad	Subclause relating to tutin to include cessation date of 31 March 2013.
5(5)	139	F2013L00247 21 Feb 2013 FSC81 21 Feb 2013	21 Feb 2013	am	Cessation date extended to 31 March 2015.
5(5)	152	F2015L00037 14 Jan 2015 FSC94 15 Jan 2015	15 Jan 2015	rs	Subclause
5(6)	152	F2015L00037 14 Jan 2015 FSC94 15 Jan 2015	15 Jan 2015	ad	Subclause relating to honey packaged before 15 January 2015.
Table to clause 5	111	F2009L03145 13 Aug 2009 FSC53 13 Aug 2009	13 Aug 2009 (31 March 2011)	ad	Entry for tutin.
Table to clause 5	121	F2011L00213 9 Feb 2011 FSC63 10 Feb 2011	10 Feb 2011	am	Entry for tutin to remove cessation date of 31 March 2011.
Table to clause 5	124	F2011L01450 8 July 2011 FSC66 11 July 2011	11 July 2011	rs	Table.
Table to clause 5	152	F2015L00037 14 Jan 2015 FSC94 15 Jan 2015	15 Jan 2015	rs, ad	Entry for tutin and to insert an Editorial note.