



Mycotoxins Factsheet

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DISCLAIMER:

Efforts have been made to provide the most comprehensive/up-to-date information regarding official documents, standards and guidelines, suppliers, methods, general information, etc.

These lists will be updated on a regular basis, as new information becomes available. These lists shall not, however, be considered as exhaustive.

Please note that the mention or otherwise of suppliers does not imply any contractual relationship with the European Commission and shall not constitute an endorsement for any of the commercial companies listed.

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Chemical structure of frequently monitored mycotoxins

Table 1: Names and structures of widely occurring mycotoxins

Name	Structure	Name	Structure
3-acetyl deoxynivalenol (3-AcDON)		Fumonisin B1	
15-acetyl Deoxynivalenol (15-AcDON)		Fumonisin B2	
Aflatoxin B1		Fumonisin B3	
Aflatoxin B2		Fusarenon-X (FUS-X)	
Aflatoxin G1		Monoacetoxyscirpenol	

Name	Structure	Name	Structure
Aflatoxin G2		Neosolaniol	
Aflatoxin M1		Nivalenol (NIV)	
Deoxynivalenol (DON)		Ochratoxin A (OTA)	
Diacetoxyscirpenol		Patulin	
Ergocornine		T-2 Toxin	
Ergocristine		HT-2 Toxin	
Ergocryptine		T2-triol	

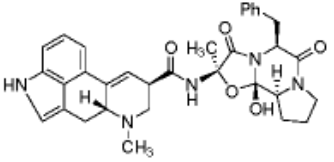
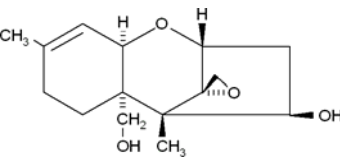
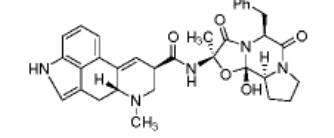
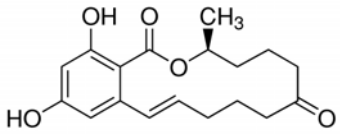
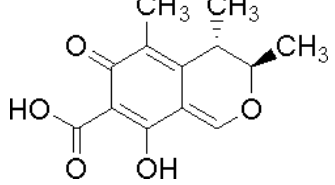
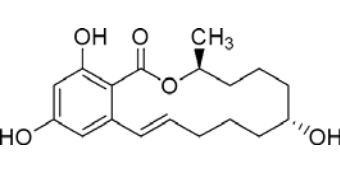
Name	Structure	Name	Structure
Ergometrine	 <p>The structure shows a complex ergoline alkaloid with a methyl group on the nitrogen, a phenylethylamine side chain, and a complex ring system including a piperidine ring.</p>	Verrucol	 <p>The structure is a bicyclic compound with a decalin-like core, a methyl group, a hydroxyl group, and a side chain containing a hydroxyl group and a methyl group.</p>
Ergotamine	 <p>The structure is very similar to Ergometrine, featuring a methyl group on the nitrogen and a phenylethylamine side chain.</p>	Zearalenone	 <p>The structure is a zearalenone derivative, consisting of a phenanthrene-like core with a methyl group and a hydroxyl group on the side chain.</p>
<i>Citrinine</i> (not mentioned in EU legislation but recently found in food additives in USA)	 <p>The structure is a pyridine ring substituted with a methyl group, a hydroxyl group, and a carboxylic acid group.</p>	α -Zearalenol	 <p>The structure is a zearalenol derivative, similar to Zearalenone but with a hydroxyl group on the side chain.</p>

Table 2: General informative links for mycotoxins

Compound	IUPAC NAME	CAS n.	References
Mycotoxins	NA ⁽¹⁾	NA ⁽¹⁾	mycotoxins.org (European Mycotoxin Awareness Network - EMAN)
			List of mycotoxins-producing fungi: Micotoxinas boletim n.46
			List of mycotoxins-producing fungi: Mycotoxins.info
			Mycotoxins
			RIVM open repository
			Wikipedia - Mycotoxins
3-acetyl deoxynivalenol	3 α -Acetoxy-7 α ,15-dihydroxy-12,13-epoxytrichothece-9-en-8-one	876926-22-6	NCBI - Pubchem Data sheet available upon registration at Romerlabs
15-acetyl deoxynivalenol	15-Acetoxy-3 α ,7 α -dihydroxy-12,13-epoxytrichothece-9-en-8-one	088337-96-6	NCBI - Pubchem Data sheet available upon registration at Romerlabs
Aflatoxin B1	NA ⁽¹⁾	001162-65-8	EMAN - Aflatoxins (valid for Aflatoxin B2, G1 and G2 as well)
			NCBI - Pubchem
			Wikipedia - Aflatoxin B1
			Data sheet available upon registration at Romerlabs
Aflatoxin B2	NA ⁽¹⁾	007220-81-7	NCBI - Pubchem
			Data sheet available upon registration at Romerlabs
Aflatoxin G1	NA ⁽¹⁾	001165-39-5	NCBI - Pubchem
			Data sheet available upon registration at Romerlabs
Aflatoxin G2	NA ⁽¹⁾	007241-98-7	NCBI - Pubchem
			Data sheet available upon registration at Romerlabs
Aflatoxin M1	NA ⁽¹⁾	006795-23-9	EMAN - Aflatoxin M1
			NCBI - Pubchem

Compound	IUPAC NAME	CAS n.	References
			Wikipedia - Aflatoxin M1
			Data sheet available upon registration at Romerlabs
Citrinin	(3R,4S)-7-(dihydroxymethylidene)-3,4,5-trimethyl-3,4-dihydroisochromene-6,8-dione	000518-75-2	EMAN - Citrinin
			NCBI - Pubchem
			Wikipedia - Citrinin
Cyclopiazonic acid	NA ⁽¹⁾	018172-33-3	EMAN - Cyclopiazonic acid
			NCBI - Pubchem - Cyclopiazonic acid
			Wikipedia - Cyclopiazonic acid
			Cyclopiazonic acid factsheet
Deoxynivalenol (Vomitoxin)	3 α ,7 α ,15-Trihydroxy-12,13-epoxytrichothec-9-en-8-one	051481-10-8	EMAN - Deoxynivalenol
			NCBI - Pubchem
			Wikipedia - Deoxynivalenol
			Data sheet available upon registration at Romerlabs
Diacetoxyscirpenol (Anguidine)	12,13-Epoxytrichothec-9-ene-3,4,15-triol-4,15-diacetate	002270-40-8	NCBI - Pubchem
Ergocornine	NA ⁽¹⁾	000564-36-3	EMAN - Ergocornine (valid also for the other ergot alkaloids in this list)
			NCBI - Pubchem
Ergocristine	NA ⁽¹⁾	000511-08-0	NCBI - Pubchem
Ergocryptine	NA ⁽¹⁾	000511-09-1	NCBI - Pubchem
Ergometrine	6 α R,9R)-N-((S)-1-hydroxypropan-2-yl)-7-methyl-4,6,6a,7,8,9-hexahydroindolo[4,3-fg]quinoline-9-carboxamide	000060-79-7	NCBI - Pubchem
			Wikipedia - Ergometrine
Ergotamine	(6 α R,9R)-N-((2R,5S,10 α S,10 β S)-5-benzyl-10 β -hydroxy-2-methyl-3,6-dioxooctahydro-2H-oxazolo[3,2-a]pyrrolo[2,1-c]pyrazin-2-yl)-7-methyl-4,6,6a,7,8,9-hexahydroindolo[4,3-fg]quinoline-9-carboxamide	000113-15-5	NCBI - Pubchem
			Wikipedia - Ergotamine

Compound	IUPAC NAME	CAS n.	References
Fumonisin B1 (Macrofusine)	1,2,3-Propanetricarboxylic acid, 1,1 ϕ -[1-(12-amino-4,9,11-trihydroxy-2-methyltridecyl)-2-(1-methylpentyl)-1,2-ethanediyl] ester	116355-83-0	EMAN - Fumonisin (valid for Fumonisin B2, B3 and B4 as well)
			NCBI - Pubchem
			Wikipedia - Fumonisin B1
			Data sheet available upon registration at Romerlabs
Fumonisin B2	2-[2-[19-amino-6-(3-carboxy-5-hydroxy-5-oxopentanoyl)oxy-16,18-dihydroxy-5,9-dimethylicosan-7-yl]oxy-2-oxoethyl]butanedioic acid	116355-84-1	NCBI - Pubchem
			Wikipedia - Fumonisin B2
			Data sheet available upon registration at Romerlabs
Fumonisin B3	2-[2-[(5R,6R,7S,9S,11R,18R,19S)-19-amino-6-(3-carboxy-5-hydroxy-5-oxopentanoyl)oxy-11,18-dihydroxy-5,9-dimethylicosan-7-yl]oxy-2-oxoethyl]butanedioic acid	NA ⁽¹⁾	NCBI - Pubchem
Fusarenon-X	NA ⁽¹⁾	023255-69-8	NCBI - Pubchem
Monoacetoxyscirpenol	NA ⁽¹⁾	096699-75-1	NCBI - Pubchem
Neosolaniol	4 β ,15-Diacetoxy-3 α ,8 α -dihydroxy-12,13-epoxytrichothec-9-ene	036519-25-2	NCBI - Pubchem
Nivalenol	3 α ,4 β ,7 α , 15-Tetrahydroxy-12,13-epoxytrichothec-9-en-8-one	023282-20-4	NCBI - Pubchem
			Data sheet available upon registration at Romerlabs
Ochratoxin A	(2S)-2-[[[(3R)-5-chloro-8-hydroxy-3-methyl-1-oxoisochroman-7-carbonyl]amino]-3-phenylpropanoic acid	000303-47-9	EMAN - Ochratoxin A
			NCBI - Pubchem
			Wikipedia - Ochratoxin A
			Data sheet available upon registration at Romerlabs
Patulin	4-hydroxy-4,6-dihydrofuro[4,5-c]pyran-2-one	000149-29-1	EMAN - Patulin
			NCBI - Pubchem
			Wikipedia - Patulin
			Data sheet available upon registration at Romerlabs

Compound	IUPAC NAME	CAS n.	References
T-2 Toxin	(2 α ,3 α ,4 β ,8 α)-4,15-bis(acetyloxy)-3-hydroxy-12,13-epoxytrichothec-9-en-8-yl 3-methylbutanoate	021259-20-1	NCBI - Pubchem Wikipedia - T-2 toxin
HT-2 Toxin	15-Acetoxy-3 α ,4 β -dihydroxy-8 α -(3-methylbutyryloxy)-12,13-epoxytrichothec-9-ene	026934-87-2	NCBI - Pubchem
Trichothecenes (T-2, HT-2, DON, NIV, 3_AcDON, 15- AcDON)	NA ⁽¹⁾	NA ⁽¹⁾	RIVM factsheet RIVM review on six trichothecenes EMAN - trichothecenes
T2-triol	NA ⁽¹⁾	NA ⁽¹⁾	
Verrucol	4 β ,15-Dihydroxy-12,13-epoxytrichothec-9-ene	002198-92-7	
Zearalenone	(3S,11E)-14,16-dihydroxy-3-methyl-3,4,5,6,9,10-hexahydro-1H-2-benzoxacyclotetradecine-1,7(8H)-dione	017924-92-4	EMAN - Zearalenone NCBI - Pubchem Wikipedia - Zearalenone Data sheet available upon registration at Romerlabs
Zearalenol (alpha)	(2E,7R,11S)-7,15,17-trihydroxy-11-methyl-12-oxabicyclo[12.4.0]octadeca-1(14),2,15,17-tetraen-13-one	036455-72-8	Chemspider NCBI - Pubchem
Others (Moniliformin, Sterigmatocystin, Ergot alkaloids)	NA ⁽¹⁾	NA ⁽¹⁾	EMAN - Sterigmatocystin EMAN - Moniliformin EMAN - Ergot alkaloids EMAN - Other mycotoxins NCBI - Pubchem - Sterigmatocystin Data sheet available upon registration at Romerlabs

(1) Not available/applicable

Regulated mycotoxins

[Eur-lex: direct access to European Law](#) (Regulations, Directives, Decisions plus Commission staff working documents, Reports, Proposals for new legislation, Recommendations, etc.)

Eur-lex webpage on Food Safety legislation: [Food Safety](#)

The European Commission Directorate General for Health and Consumers webpage on mycotoxins: [DG SANCO](#)

Worldwide regulations for mycotoxins in food and feed in 2003 – FAO Food and Nutrition Paper 80 (2003): [Link to PDF file](#)

A comprehensive and up-to-date computerized legislative database: [FAOLEX](#)

A search engine for food legislation and RASFF [FC 24](#)

Action levels in feed for the American Board of Veterinary Toxicology:
[FDA compliance levels for feed](#)

Table 3: EU legislation concerning mycotoxins in food and feed (when available, the consolidated version is reported)

Legislative Reference	Matrix	ML⁽¹⁾ (Y/N)	Compound
Commission Regulation (EC) No 1881/2006	Food	N ⁽⁴⁾	3-acetyl deoxynivalenol 15-acetyl deoxynivalenol Diacetoxyscirpenol Fumonisin B3 Fusarenon-X Monoacetoxyscirpenol Neosolaniol T2-triol Verrucol
		N (TDI) ^(3,4)	Trichothecenes (NIV + T-2 & HT-2 + DON)
		Y	Aflatoxins (Sum of B1, B2, G1 and G2) Aflatoxin M1 Deoxynivalenol Fumonisin (B1 and B2) Ochratoxin A Patulin T-2 and HT-2 toxins Zearalenone

Legislative Reference	Matrix	ML⁽¹⁾ (Y/N)	Compound
Directive 2002/32/EC of the European Parliament and the Council	Feed	Y	Aflatoxin B1
Commission Recommendation (2006/576/EC) of 17 August 2006 on the presence of deoxynivalenol, zearalenon, ochratoxin A, T-2 and HT-2 and fumonisins in products intended for animal feeding	Feed	Y (GV) ⁽²⁾	Deoxynivalenol Fumonisin (sum of B1 and B2) Ochratoxin A Zearalenon
		N	T-2 and HT-2 toxins
Commission Recommendation (2006/583/EC) of 17 August 2006 on the prevention and reduction of Fusarium Toxins in cereals and cereals products	Cereals (preventive measures)	N	Fusarium toxins
Commission Recommendation (2003/598/EC) of 11 August 2003 on the prevention of patulin contamination in apple juice and apple juice ingredients in other beverages	Food (preventive measures)	N	Patulin
Commission Regulation (EC) No 401/2006	Food	N	Aflatoxins (Sum of B1, B2, G1 and G2) Aflatoxin M1 Ochratoxin A Patulin Deoxynivalenol Zearalenon Fumonisin B1 and B2 T-2 and HT-2 toxin

(1) Maximum level (Y=yes; N=no)

(2) Guidance value

(3) Tolerable daily intake

(4) No specific measures needed

(5) Method performance

Toxicity

1. [IARC \(International Agency for Research on Cancer\) classification](#)
2. [IARC list of carcinogenic agents](#)
3. For most of the Mycotoxins of interest the information can be found in the following IARC volumes:
 - a. [IARC Monograph Volume 82](#)
 - b. [IARC Monograph Volume 56](#)
 - c. [IARC Monographs: Supplement 7 - Update of Volumes 1-42](#)
4. [OECD \(Organisation for Economic Co-operation and Development\) guidelines for the testing of chemicals](#)

Table 4: IARC classification for carcinogenicity

Group	Definition
1	The agent (mixture) is carcinogenic to humans. The exposure circumstance entails exposures that are carcinogenic to humans
2A	The agent (mixture) is probably carcinogenic to humans. The exposure circumstance entails exposures that are probably carcinogenic to humans.
2B	The agent (mixture) is possibly carcinogenic to humans. The exposure circumstance entails exposures that are possibly carcinogenic to humans.
3	The agent (mixture or exposure circumstance) is not classifiable as to its carcinogenicity to humans.
4	The agent (mixture) is probably not carcinogenic to humans.

Table 5: Toxicology and epidemiology related links

Compound	Matrix	Useful link
Mycotoxins	NS ⁽¹⁾	Various categories of information (toxicology, occurrence, analytical methods): BugWood
	NS ⁽¹⁾	Summary of toxicological effects of mould toxins: SIGMA Aldrich Table
		"Mycotoxins, Endemic Nephropathy and Urinary Tract Tumours" IARC Scientific Publication No 115 Castegnaro, M., Plestina, R., Dirheimer, G., Chernozemsky, I.N., Bartsch, H. IARC publication PDF
		Adverse health effects RIVM Mycotoxins datasheet
		Emerging risks: RIVM information sources
		Toxicological effects: Mycotoxins.info
	Feed	Mycotoxinoses in Domestic Animals: The Merck Veterinary Manual
Food	"Evaluation of Certain Mycotoxins in Food" Fifty-sixth Report of the Joint FAO/WHO Committee on Food Additives Technical Report Series, No 906 WHO publication PDF	
	JECFA report on Third Joint FAO/WHO/UNEP International Conference on Mycotoxins: JECFA Report 1999	
3-acetyl deoxynivalenol (not classified in IARC)	NS ⁽¹⁾	RIVM factsheet RIVM review on six trichothecenes
	Food	"Subacute Toxicity of Dietary 3-Acetyldeoxynivalenol in Mice" Can J Comp Med 1985 ; 49: 319-322 PubMed PDF
15-acetyl deoxynivalenol (not classified in IARC)	NS ⁽¹⁾	RIVM factsheet RIVM review on six trichothecenes
	Feed	"Deoxynivalenol: Toxicity, mechanisms and animal health risks" Animal Feed Science and Technology 2007 ; 137: 283–298
Aflatoxins (naturally occurring mixtures of) Aflatoxin B1 Aflatoxin B2 Aflatoxin G1 Aflatoxin G2 (IARC classification: 1)	Food	Scientific Committee for Food (SCF) report (1996) including Aflatoxins, Ochratoxin A and Patulin SCF reports series 35
		Opinion of the scientific panel on contaminants in the food chain [CONTAM] related to the potential increase of consumer health risk by a possible increase of the existing maximum levels for aflatoxins in almonds, hazelnuts and pistachios and derived

Compound	Matrix	Useful link
		products. Adopted in 2007 The EFSA Journal (2007) 446, 1-127
		Statement of the Panel on Contaminants in the Food Chain on effects on public health of an increase of the levels for aflatoxin total from 4 µg/kg to 10 µg/kg for tree nuts other than almonds, hazelnuts and pistachios The EFSA Journal (2009) 1168, 1-11
		Aflatoxicosis U.S. FDA - Aflatoxins
		WHO Technical Report Series, No. 947/2007 "Evaluation of Certain Food Additives and Contaminants" WHO Press link
	NS ⁽¹⁾	Toxicological effects: Aspergillusflavus.org
		Cancer Potency: The carcinogenic potency database (CPDB) - Aflatoxin B1 CPDB - Aflatoxin crude
		Toxicosis in animals: Merck veterinary manual - Aflatoxicosis
	Feed	Opinion of the Scientific Panel on Contaminants in the Food Chain on a request from the Commission related to Aflatoxin B1 as undesirable substance in animal feed. Adopted in 2004 The EFSA Journal (2004) 39, 1-27
		Review of mycotoxin-detoxifying agents used as feed additives: mode of action, efficacy and feed/food safety Scientific report submitted to EFSA
	Aflatoxin M1 (IARC classification: 2B)	Feed
NS ⁽¹⁾		JECFA Toxicological Monograph FAS 47/FNP 74-JECFA 56/1
Citrinin (IARC classification: 3)	NS ⁽¹⁾	Cancer Potency: CPDB - Citrinin
Cyclopiazonic acid (not classified in IARC)		Cyclopiazonic acid factsheet
Deoxynivalenol (IARC classification: 3)	Food	Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 1: Deoxynivalenol (DON), (expressed on 2 December 1999) SCF/CS/CNTM/MYC/19 Final SCF opinion (SCF/CS/CNTM/MYC/19 Final)
		Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 6: Group evaluation of T-2 toxin, HT-2toxin, nivalenol and

Compound	Matrix	Useful link
		deoxynivalenol. (adopted on 26 February 2002) SCF opinion (SCF/CS/CNTM/MYC/27 Final)
	Feed	Opinion of the Scientific Panel on contaminants in the food chain [CONTAM] related to Deoxynivalenol (DON) as undesirable substance in animal feed. Adopted in 2004 The EFSA Journal (2004) 73, 1-72
	NS ⁽¹⁾	JECFA Toxicological Monograph FAS 47/FNP 74-JEFCA 56/419 Cancer Potency: CPDB - Deoxynivalenol
Diacetoxyscirpenol (Anguidine) (not classified in IARC)	NS ⁽¹⁾	RIVM factsheet RIVM review on six trichothecenes "Short-term effects of two fusarium toxins, diacetoxyscirpenol and neosolaniol monoacetate, in male wistar rats" Food-Chem-Toxicol. 1987; 25: 767-71 Sciencedirect publication link
Fumonisin (IARC classification for Fumonisin B1, B2 and Fusarin C: 2B)	Food	Updated opinion of the Scientific Committee on Food on Fumonisin B1, B2 and B3. SCF opinion (SCF/CS/CNTM/MYC 28 Final)
	Feed	Opinion of the Scientific Panel on contaminants in the food chain [CONTAM] related to fumonisins as undesirable substances in animal feed. Adopted in 2005 The EFSA Journal (2005) 235, 1-32
	NS ⁽¹⁾	Toxicosis in animals: Merck veterinary manual - Fumonisin toxicosis
Fumonisin B1 (IARC classification: 2B)	Food	Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 3: Fumonisin B1 (FB1) (expressed on 17 October 2000) SCF opinion (SCF/CS/CNTM/MYC/24 Final)
	NS ⁽¹⁾	Cancer Potency: CPDB - Fumonisin B1 Carcinogenicity and other toxicological effects: EHC - Fumonisin B1
Fusarenon-X (IARC classification: 3)	NS ⁽¹⁾	RIVM factsheet RIVM review on six trichothecenes Cancer Potency: CPDB - Fusarenon X
Monoacetoxyscirpenol (not classified in IARC)	Food and Feed	"Fusarium toxins of the scirpentriol subgroup: a review" Mycopathologia 2007 ; 164:101-118 SpringerLink purchase page
Neosolaniol (not classified in IARC)	NS ⁽¹⁾	RIVM factsheet RIVM review on six trichothecenes
		"Short-term effects of two fusarium toxins, diacetoxyscirpenol and neosolaniol monoacetate, in male wistar rats" Food and Chemical

Compound	Matrix	Useful link
		Toxicology 1987 ; 25: 767-71 Sciencedirect publication link
Nivalenol (IARC classification: 3)	Food	Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 4: Nivalenol (expressed on 19 October 2000) SCF opinion (SCF/CS/CNTM/MYC/26 Final)
		Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 6: Group evaluation of T-2 toxin, HT-2toxin, nivalenol and deoxynivalenol. (adopted on 26 February 2002) SCF opinion (SCF/CS/CNTM/MYC/27 Final)
	NS ⁽¹⁾	RIVM factsheet RIVM review on six trichothecenes
	NS ⁽¹⁾	Cancer Potency: CPDB - Nivalenol
Ochratoxin A (IARC classification: 2B)	Food	Opinion of the Scientific Panel on contaminants in the food chain [CONTAM] related to Ochratoxin A in food. Adopted in 2006 The EFSA Journal (2006) 365, 1-56
		Scientific Committee for Food (SCF) report (1996) including Aflatoxins, Ochratoxin A and Patulin SCF reports series 35
		Opinion of the Scientific Committee on Food on Ochratoxin A (expressed on 17 September 1998) SCF reports series 14
		Opinion of the Scientific Panel on Contaminants in the Food Chain on Statement on recent scientific information on the toxicity of Ochratoxin A The EFSA Journal (2010); 8(6): 1626
	WHO Technical Report Series, No. 947/2007 "Evaluation of Certain Food Additives and Contaminants" WHO Press link	
	Feed	Opinion of the Scientific Panel on Contaminants in Food Chain on a request from the Commission related to ochratoxin A (OTA) as undesirable substance in animal feed. Adopted in 2004 The EFSA Journal (2004) 101, 1-36
	NS ⁽¹⁾	Cancer Potency: CPDB - Ochratoxin A
Patulin (IARC classification: 3)	Food	Scientific Committee for Food (SCF) report (1996) including Aflatoxins, Ochratoxin A and Patulin SCF reports series 35
		Opinion expressed by the Scientific Committee on Food during the plenary meeting on 8 March 2000. SCF minute statement
	NS ⁽¹⁾	Cancer Potency: CPDB - Patulin
Sterigmatocystin	NS ⁽¹⁾	OEHHA NSRL

Compound	Matrix	Useful link
(IARC classification: 2B)		Cancer Potency: CPDB - Sterigmatocystin
T-2 + HT-2 (IARC classification for T-2 toxin: 3)	Food	Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 5: T-2 toxin and HT-2 toxin (adopted on 30 May 2001) SCF Opinion (SCF/CS/CNTM/MYC/25 Rev 6 Final)
		Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 6: Group evaluation of T-2 toxin, HT-2toxin, nivalenol and deoxynivalenol. (adopted on 26 February 2002) SCF opinion (SCF/CS/CNTM/MYC/27 Final)
		Report on toxicity data on trichothecene mycotoxins HT-2 and T-2 toxins Scientific report submitted to EFSA
	NS ⁽¹⁾	Cancer Potency: CPDB - T2 toxin
Trichothecenes	NS ⁽¹⁾	Toxicosis in animals: Merck veterinary manual - Trichothecenes toxicosis
		Toxicology and occurrence of nivalenol, fusarenon X, diacetoxyscirpenol, neosolaniol and 3- and 15-acetyldeoxynivalenol: a review of six Trichothecenes RIVM report
T2-triol (not classified in IARC)	NS ⁽¹⁾	NS ⁽¹⁾
Verrucol (not classified in IARC)	NS ⁽¹⁾	NS ⁽¹⁾
Zearalenon (IARC classification: 3)	Food	Opinion of the Scientific Committee on Food on Fusarium-toxins. Part 2: Zearalenone (ZEA), (expressed on 22 June 2000) - SCF/CS/CNTM/MYC/22 Rev 3 Final SCF opinion (SCF/CS/CNTM/MYC/22 Rev 3 Final)
		"Safety evaluation of certain food additives and contaminants" WHO - Food Additives Series 44 (2000)
	Feed	Opinion of the Scientific Panel on contaminants in the food chain [CONTAM] related to Zearalenone as undesirable substance in animal feed. Adopted in 2004 The EFSA Journal (2004) 89, 1-35
	NS ⁽¹⁾	Cancer Potency: CPDB - Zearalenon

(1) Not specified

Occurrence

On the web site of the Directorate-General for Health and Consumers (DG SANCO), under the Rapid Alert System for Food and Feed, a list of alert notifications, information notifications and border rejections for various contaminations and/or non-compliances for food and feed can be found: [RASFF](#), [RASFF portal](#), [RASFF 2009 report](#), [International Portal on Food Safety, Animal & Plant Health](#)

Table 6: Some links concerning Mycotoxin occurrence in various matrices

Compound	Matrix	Useful link
Mycotoxins	Unprocessed cereals and Feed	Conditions of fungi growth: Mycotoxins.info
		Various categories of information (toxicology, occurrence, analytical methods): BugWood
		Geographical distribution of occurrence: Mycotoxins.info
		Feed storage conditions: Mycotoxins.info
		"Grain storage techniques - Evolution and trends in developing countries" - Edited by D.L. Proctor, FAO Consultant FAO Agricultural Services Bulletin n. 109
	Various	Emerging risks: RIVM information sources
	Food	"Mycotoxins: The Cost of Achieving Food Security and Food Quality" APS net
		"Manual on the application of the HACCP system in Mycotoxin prevention and control" FAO Food and Nutrition Paper 73
		"Food, Nutrition and Agriculture" FAO Food and Nutrition Paper 23
		"Effect of Food Processing on Mycotoxin Levels" EMAN - Expert factsheet
		Decontamination of mycotoxin contaminated raw materials EMAN - Training course
		FAO - Mycotoxins and food supply
		"Climate change: implications for food safety" FAO PDF file
	Environment	Mould-help webpage: a list of mycotoxins

Compound	Matrix	Useful link
		Mould-help web page: description of possible indoor fungi and effects of the produced toxins
Aflatoxins	Food	"Prevention of aflatoxin in pistachios" E. Boutrif FAO Food and Nutrition Paper 21
		"Aflatoxin Contamination of Commercial Maize Products during an Outbreak of Acute Aflatoxicosis in Eastern and Central Kenya" Environmental Health Perspectives - 2005
	Air	Chemical Sampling Information – Aflatoxin (B2) OSHA.gov
Fumonisin	Food and Feed	Fumonisin Levels in Human Foods and Animal Feeds CFSAN - FDA - Guidance for Industry
	Food	SCOOP report: "Collection of occurrence data of Fusarium toxins in food and assessment of dietary intake by the population of EU Member States" Task 3.2.10 (April 2003)
		"Mycotoxin prevention and decontamination – a case study on maize" FAO Food and Nutrition Paper 22
Ochratoxin A	Food	SCOOP report: "Assessment of dietary intake of Ochratoxin A by the population of EU Member States" Task 3.2.7 (January 2002)
		"Surveillance and Occurrence Studies on Ochratoxin A" EMAN - Expert factsheet
		Naturally Occurring Ochratoxins EMAN - Basic factsheet
Patulin	Food	SCOOP report: "Assessment of dietary intake of Patulin by the population of EU Member States" Task 3.2.8 (March 2002)
		Sec. 510.150 Apple Juice, Apple Juice Concentrates, and Apple Juice Products - Adulteration with Patulin FDA - Compliance guidance document
Trichothecenes	Various	"Toxicology and occurrence of nivalenol, fusarenon X, diacetoxyscirpenol, neosolaniol and 3- and 15-acetyldeoxynivalenol: a review of six Trichothecenes" RIVM report
	Food and Feed	Occurrence data of trichothecene mycotoxins T-2 toxin and HT-2 toxin in food and feed Scientific report submitted to EFSA
	Food	SCOOP report: "Collection of occurrence data of Fusarium toxins in food and assessment of dietary intake by the population of EU Member States" Task 3.2.10 (April 2003)
Research Project: "Control of Fusarium Graminearum mycotoxins in wheat, barley and corn"		

Compound	Matrix	Useful link
		USDA - Agricultural Research Service
Zearalenon	Food	SCOOP report: "Collection of occurrence data of Fusarium toxins in food and assessment of dietary intake by the population of EU Member States" Task 3.2.10 (April 2003)

Useful links

European Commission

DG Health and Consumers – Food and feed safety – Contaminants: [Patulin](#) ; [Ochratoxin A](#) ; [Fusarium toxins](#) ; [Aflatoxins](#) (Directorate General Health and Consumers of the European Commission – DG SANCO)

[EFSA](#) (European Food Safety Authority)

International organisations of general interest for analytical chemistry and food safety

[AACC](#) (AACC International – formerly denominated American Association of Cereal Chemists)

[ACS-AGFD](#) & [ACS-AC](#) (American Chemical Society – Agricultural and Food Chemistry Division & Analytical Chemistry Division)

[AOAC](#) (AOAC International – The Association of Official Analytical Chemists)

[CEN](#) (European Committee for Standardization)

[CIAA](#) (Confederation of the Food and Drink Industries in the EU. The webpage includes general information about food production and agricultural subjects)

[CITAC](#) (Cooperation on International Traceability in Analytical Chemistry)

[Codex Alimentarius](#) (Joint FAO/WHO Food Standards)

[EA](#) (European co-operation for Accreditation: association for accreditation bodies)

[Eurachem](#) (A network of organisations working for the improvement of traceability of chemical measurements)

[Euramet](#) (European Association of National Metrology Institutes)

[Eurolab](#) (the European Federation of National Associations of Measurement, Testing and Analytical Laboratories)

[FDA](#) (US Food and Drug Administration – Food Safety – Food contaminants and adulteration – Natural toxins)

[IAF](#) (International Accreditation Forum)

[IAFP](#) (International Association for Food Protection portal)

[ILAC](#) (International Laboratory Accreditation Cooperation)

[ILSI Europe](#) (International Life Sciences Institute)

[IPFSAPH](#) (International Portal on Food Safety, Animal and Plant Health - IPFSAPH)

[ISO](#) (International Organization for Standardization)

[IUPAC](#) (International Union of Pure and Applied Chemistry)

[NMI](#) (National Measurement Institute – Australia)

[NMKL](#) (Nordic committee on food analysis – Methods, Guidelines - e.g. Validation Protocol, Measurement Uncertainty - Training, list of Expert Laboratories are only a few examples of the very useful information that are available in the web-page, some information only accessible upon subscription)

[OECD](#) (Organisation for economic co-operation and development)

[USDA](#) (United States Department of Agriculture – Research and Science)

[VAM](#) (National Measurement System - Chemical and Biological Metrology Website: Guides and other useful publications)

[WTO](#) (World Trade Organisation)

Organisations of specific interest and some e-publications

[AAFCO](#) (Association of American Feed Control Officials)

[aspergillus.org](#) (List of mycotoxin metabolites, including their chemical and toxicological properties)

[Aspergillusflavus.org](#) (Webpage mostly for botanical and medical applications)

[BIOCOP](#), [BIOCOP - Workpackage 10: Mycotoxins](#) (the FP6 Biocop project, focussing on new measurement strategies applied to detection of food contamination. The webpage includes a description of the project and a regularly updated "Events" page).

[Cereal Disease Laboratory](#) (webpage of the Cereal Disease Laboratory of the Agriculture Research Service – United States Department of Agriculture)

[EU-RLs-Pesticides](#) (common portal for all European Union Reference Laboratories for Residues of Pesticides: well organised and containing a lot of useful information)

[EU-RL for dioxins and PCBs in feed and food](#)

[Fera](#) (The food and Environment Research Agency web site)

[FAO - mycotoxins section](#) (Joint FAO/WHO Expert Committee on Food Additives (JECFA) - activities on mycotoxins)

[Food magazine.eu](#)

[ICRISAT-Aflatoxins](#) (International Crops Research Institute for the Semi-Arid Tropics - Patancheru, India. The webpage presents a general overview on aflatoxins)

[Know Mycotoxins](#) (a well structured, dedicated website)

[Micotoxinas - boletim](#) (Newsletter of the Brazilian website dedicated to scientific news on mycotoxins)

[Molnar Institute](#) (Software for chromatography, collection of literature on HPLC methods development and application, training)

[MoniQA project](#) (FP6 MoniQA - "Monitoring and Quality Assurance in the Food Supply Chain" - project webpage: quality assurance and quality control for bio toxins and mycotoxins is one of the priority topics of the project)

[Mycobank](#) (a complete database of all fungi)

[Myco-globe](#) (FP6 project for an integrated system for mycotoxins)

[Mycology](#) (Webpage for medical and botanical applications)

[Mycored](#) (FP7 project - Novel integrated strategies for worldwide mycotoxin reduction in food and feed chains)

[Mycotoxins: biosecurity and food safety](#) (US Purdue University Project "Mycotoxins: Biosecurity and Food Safety")

[Mycotoxins newsletter](#) (IUPAC Mycotoxin Newsletter edited by Carlo Brera of the ISS-Italy – discontinued in 2001)

[Mycotoxins.org](#) (European Mycotoxin Awareness Network – EMAN. A very important site for all people working in fields of research on which mycotoxins have impact: chemistry, agriculture, health. It contains information on: analytical methods, test kits, prevention and HACCP, quality assurance issue, etc.)

[OHIO State University](#) (Project on mycotoxins: a large amount of useful information and links reported)

[Purdue University](#) (Indiana - United States, Purdue University, Biosecurity and Food Safety, list of useful links)

[RIKILT](#) (RIKILT – Institute of Food Safety is an independent research institute in the area of safe and healthy food)

[SAFE consortium](#) (European Association for Food Safety web page: among the items of the consortium database, several are related for mycotoxin prevention and control, rapid detection methods in food and feed, isolation and characterization of masked mycotoxins in cereals and derived products, methods for simultaneous determination of mycotoxins in cereals and derived products)

[Society for Mycotoxin Research](#) (Promotion of research in different scientific disciplines related with mycotoxins)

Publications

Some of the most popular search engines that can be used to find scientific literature sources (books, journals and others) and to search for specific items are listed below:

[SCIRUS](#) (over 450 million scientific items indexed)

[Food navigator](#) (Foodnavigator.com Europe)

[Agris](#) (FAO Search application for Agricultural Sciences and Technologies)

[SCOPUS](#)

[ScienceDirect](#)

[SwetsWise](#)

[PubMed](#)

[EBSCO](#)

[Springerlink](#)

The following journals are relevant for the mycotoxin field:

[World Mycotoxin Journal](#)

[Mycotoxin Research](#)

[International Journal of Food Microbiology](#)

[Food additives & contaminants](#)

[Journal of Agriculture and Food Chemistry](#)

[Food and Chemical Toxicology](#)

[Mycotoxins - Japanese Society of Mycology](#)

Books

The following books are some of the works that could be considered as a helpful support in the field of Mycotoxins.

The mycotoxin factbook - Food & feed topics, D. Barug, D. Bhatnagar, H.P. van Egmond, J.W. van der Kamp, W.A. van Osenbruggen and A. Visconti Editors. **2006**: Wageningen Academic Publishers.

[Wageningen Academic Publishers link for book description](#)

Manual on the application of the HACCP system in Mycotoxin prevention and control, Food and Agriculture Organization of the United Nations Editor. **2001**: FAO.

[FAO - PDF file of the book](#)

Natural Toxicants in Food (Chapters 7, 9 and following), D.H. Watson Editor. **1998**: Sheffield Academic Press – CRC Press.

[FAO - AGRIS link for book search](#)

Mycotoxins in fruit and vegetables, R. Barkai-Golan Editor. **2008**: Academic Press, Elsevier.

[Elsevier link for book description](#)

Food Contaminants and Residue Analysis, 51, Y. Picó, Editor. **2008**: Elsevier.

[Elsevier link for book description](#)

The Mycotoxin Blue Book, Duarte Diaz Editor. **2005**: Nottingham University Press.

[Springerlink - Book review](#)

Mycotoxin prevention and control in foodgrains, R.L. Semple, A.S. Frio, P.A. Hicks and J.V. Lozare Editors. **1989**: RAP Publication.

[FAO link for book download](#)

Guidelines

Description of Standardisation bodies activities

CEN (European Committee for Standardization) TC 275 is the Technical Committee for Food Analysis – Horizontal methods. Via the following links the current activities of the committee including released standards and on-going activities for the preparation of new standards can be consulted. Working group (WG) 5 (Biotoxins) and WG 0 (General considerations) are the two WGs dealing with items of interest for laboratories performing mycotoxin determinations in food matrices. For laboratories dealing with feed samples, information about activities of CEN/TC 327/WG 1 (Animal Feeding Stuffs – Methods of sampling and analysis – Organic contaminants) is important.

[CEN/TC 275](#), [CEN/TC 327](#)

ISO (International Organization for Standardization) is composed of many different Technical Committees. TC 34 (Food products), TC 69 (Applications of statistical methods), TC 176 (Quality management and quality assurance) and TC 243 (Project Committee: Consumer product safety) are the relevant ones for Food Control Laboratories. In the ISOTC Portal all information about current activities of the TCs can be found, within the Public information folder:

[ISO TC 34\(Food products\) ISO TC 34 Newsletter](#)

[ISO TC 69](#)

[ISO TC 176](#)

[ISO TC 243](#)

List of useful links to documents

[DG Health and Consumers Report on compliancy to legislative limits](#)

DG SANCO Report on the relationship between analytical results, measurement uncertainty, recovery factors and the provisions of EU Food and Feed legislation, with particular reference to Community legislation concerning contaminants in food and undesirable substances in feed

[DG Health and Consumers support document](#)

Directorate General for Health and Consumers "Guidance document for competent authorities for the control of compliance with EU legislation on aflatoxins"

[AOAC Document on method validation](#)

Validation: An invisible Component of Measurement. An explicative paper concerning the meaning of validation, written by Horwitz.

[AOAC Book on accreditation](#)

AOAC Book "Guidelines for Laboratories Performing Microbiological and Chemical Analyses of Food and Pharmaceuticals"

[AOAC ALACC Guide 2007](#)

AOAC Guide "How to Meet ISO 17025 - Requirements for Method Verification"

[CEN Guidance document](#)

Guidance - Uncertainty of measurement concept in European Standards

[List of EA publications](#)

[EA 04/16](#)

European Co-operation for Accreditation "EA guidelines on the expression of uncertainty in quantitative testing"

[EA 04/14](#)

EA Guideline "The Selection and Use of Reference Materials"

[EA 04/18](#)

EA Guideline "Guidance on the level and frequency of proficiency testing participation"

[Eurachem guide on uncertainty](#)

Measurement uncertainty arising from sampling: A guide to methods and approaches Produced jointly by Eurachem, EUROLAB, CITAC, Nordtest and the RSC Analytical Methods Committee

[Eurachem guide on compliance of results](#)

Eurachem/CITAC guide: "Use of uncertainty information in compliance assessment"

[Eurachem guide on fitness for purpose](#)

Eurachem Guide "The Fitness for Purpose of Analytical Methods. A Laboratory Guide to Method Validation and Related Topics"

[Eurachem/CITAC CG2](#)

Eurachem/CITAC Guide "Quality Assurance for Research and Development and Non-routine Analysis"

[IUPAC/ISO/AOAC International/Eurachem report on recovery](#)

"Harmonised guidelines for the use of recovery information in analytical measurement"

[Eurachem/CITAC CG4](#)

EURACHEM / CITAC Guide "Quantifying Uncertainty in Analytical Measurement" Second Edition

[Eurachem guide on proficiency testing](#)

Eurachem Guide "Selection, use and interpretation of proficiency testing (PT) schemes by laboratories – 2000 Edition 1.0"

[Eurachem guide on VIM 3](#)

Eurachem Guide "Terminology in Analytical Measurement: Introduction to VIM 3"

[Eurachem/CITAC guide on accreditation](#)

Eurachem/CITAC "Guide to Quality in Analytical Chemistry - An Aid to Accreditation"

[Eurachem guide EEE-RM-062rev3](#)

Eurachem Guide "The selection and use of Reference Materials – A basic guide for laboratories and accreditation bodies"

[Eurachem/CITAC guide on traceability](#)

EURACHEM / CITAC Guide "Traceability in Chemical Measurement - A guide to achieving comparable results in chemical measurement"

[EU-RL PAHs document on calibration](#)

Frequently asked questions on calibration

[Eurolab Report on MU](#)

Eurolab Technical Report n. 1/2007 "Measurement uncertainty revisited: Alternative approaches to uncertainty evaluation"

[Eurolab Report on Flexible Scope Accreditation](#)

Eurolab Technical Report n. 2/2008 "EUROLAB Inquiry: Use of the Accreditation Symbol and Accreditation with Flexible Scope – Results"

[ILAC Guidelines](#) (a list of the issued documents related to Quality Assurance and Control in Laboratories)

[ILAC Document on MU](#)

ILAC Guide G17:2002 "Introducing the Concept of Uncertainty of Measurement in Testing in Association with the Application of the Standard ISO/IEC 17025"

[ILAC Document on RM](#)

ILAC Guide G9:2005 "Guidelines for the Selection and Use of Reference Materials"

[ILAC Document on Calibration](#)

ILAC Guide G24:2007 "Guidelines for the determination of calibration intervals of measuring instruments"

[ILAC document on reporting of results](#)

ILAC Guide G8:2009 "Guidelines on the Reporting of Compliance with Specification"

[ILAC Document for scope of accreditation](#)

ILAC Guide G18:2010 "Guideline for the Formulation of Scopes of Accreditation for Laboratories"

[ISO Standard](#)

ISO Guide 33:2000 "Uses of certified reference materials"

[ISO Technical Specification](#)

ISO/TS 21748:2004 "Guidance for the use of repeatability, reproducibility and trueness estimates in measurement uncertainty estimation"

[ISO Standard](#)

ISO 13528:2005 "Statistical methods for use in proficiency testing by interlaboratory comparisons"

[ISO Standard](#)

ISO 17043:2010 "Conformity assessment -- General requirements for proficiency testing"

[ISO Standard](#)

ISO Guide 32:1997 "Calibration in analytical chemistry and use of certified reference materials"

[ISO Standard](#)

ISO 11843-1:1997 "Capability of detection -- Part 1: Terms and definitions"

[ISO Standard](#)

ISO 11843-2:2000 "Capability of detection -- Part 2: Methodology in the linear calibration case"

[ISO Standard](#)

ISO 11843-3:2003 "Capability of detection -- Part 3: Methodology for determination of the critical value for the response variable when no calibration data are used"

[ISO Standard](#)

ISO 11843-4:2003 "Capability of detection -- Part 4: Methodology for comparing the minimum detectable value with a given value"

[ISO Standard](#)

ISO 11843-5:2008 "Capability of detection -- Part 5: Methodology in the linear and non-linear calibration cases"

[ISO Standard](#)

ISO 11095:1996 "Linear calibration using reference materials"

[ISO Standard](#)

ISO 28037:2010 "Determination and use of straight-line calibration functions"

[ISO Standard](#)

ISO 21748:2010 "Guidance for the use of repeatability, reproducibility and trueness estimates in measurement uncertainty estimation"

[ISO Standard](#)

ISO 7966:1993 "Acceptance control charts"

[ISO Standard](#)

ISO 7870-1:2007 "Control charts -- Part 1: General guidelines"

[ISO Standard](#)

ISO 8258:1991 "Shewhart control charts"

[ISO Standard](#)

ISO/TR 7871:1997 "Cumulative sum charts -- Guidance on quality control and data analysis using CUSUM techniques"

[ISO Standard](#)

ISO 7873:1993 "Control charts for arithmetic average with warning limits"

[ISO Standard](#)

ISO 3534-1:2006 "Statistics -- Vocabulary and symbols -- Part 1: General statistical terms and terms used in probability"

[ISO Standard](#)

ISO 3534-2:2006 "Statistics -- Vocabulary and symbols -- Part 2: Applied statistics"

[ISO Standard](#)

ISO 3534-3:1999 "Statistics -- Vocabulary and symbols -- Part 3: Design of experiments"

[IUPAC Document on PTs](#)

IUPAC Technical report – "The International Harmonized Protocol for the proficiency testing of analytical chemistry laboratories" M. Thompson et al.

[IUPAC Document on IQC](#)

IUPAC Technical report - "Harmonized guidelines for internal quality control in analytical chemistry laboratories" M. Thompson and R. Wood

[IUPAC Document on MV](#)

IUPAC Technical report – " Harmonized guidelines for single-laboratory validation of methods of analysis" M. Thompson et al.

[IUPAC Document on recovery](#)

IUPAC Recommendations "Use of the terms "recovery" and "apparent recovery" in analytical procedures" D.T. Burns et al.

[LGC Best practice guide for calibration design](#)

LGC Document "Preparation of calibration curves – a guide to best practice. (2003)

[NIST Document on MU](#)

NIST Technical Note 1297 - 1994 Edition "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results"

[NMS list of Guides](#)

National Measurement System: Chemical and Biological Metrology Website

[NORDTEST Document on MU](#)

NORDTEST Technical report 537 (2003) – "Handbook for Calculation of Measurement Uncertainty in Environmental Laboratories"

[The Royal Society of Chemistry - AMC](#)

Analytical Methods Committee Technical Briefs: a series of short publications of very high utility for analytical chemists

[VIM 2008](#)

International vocabulary of metrology — Basic and general concepts and associated terms

Training

Institute for Reference Materials and Measurements

[IRMM training page](#)

SARAF (School for Advanced Residue Analysis in Food)

Courses about analytical, QC and QA, reporting aspects for residues in food.

[SARAF](#)

Basic Toxicology Courses. Covered topics range from basic principles of toxicology to epidemiology, from legislation to risk assessment.

[EUROTOX](#)

European Union Reference Laboratory for Single Residue Methods training programme 2008

[EU-RL pesticides training page](#)

Molnar Institute intensive courses for HPLC users

[MI courses](#)

The United Kingdom Accreditation Service calendar of courses

[UKAS training](#)

Proficiency testing providers

Database of Proficiency Tests available in Europe: [EPTIS](#)

[AACC](#)

[AAFCO](#)

[AOAC](#)

[FAPAS](#)

[FEPAS](#)

[LGC](#)

[National Measurement Institute](#) of Australia

[UNICHIM](#) (in Italian)

Suppliers of calibrations standards (pure substances, solutions, isotopically labelled standards)

Mycotoxin detection kits tested and validated by AOAC (Association of Analytical Communities)

[AOAC](#)

Single standards (solid and solutions) and mixtures

[Tecna LAB](#)

Single standards (solid and solutions) and mixtures, from different suppliers

[ChemIndustry: example of search for Ochratoxin A](#)

Single standards (solid and solutions, native or labelled, and conjugates) or calibrant mixtures

[SIGMA Aldrich](#)

Single standards (solid and solutions) and mixtures, from different suppliers.

[VWR](#)

Single standards (solid and solutions, native and labelled, conjugates and masked) and calibrant mixtures. Datasheets for registered users.

[Romerlabs](#)

Single standards (solid and solutions) and mixtures, from different suppliers.

[Chemexper](#)

Bioactive substances and standard solutions (producer and distributor).

[Fermentek](#)

Single standards (solid and solutions, native and labelled, conjugates) and calibrant mixtures. Datasheets available.

[Tebu-bio](#)

Single standards (solid). Datasheets available.

[Santa Cruz biotechnology](#)

Certified reference materials and reference materials

Certified matrix and pure substance reference materials

[JRC-IRMM catalogue PDF format](#) or [JRC-IRMM catalogue search engine](#)

BCR® - 423 (Aflatoxin M1 in chloroform)

[JRC - IRMM link to the product](#)

ERM® - AC057 (Aflatoxin B1 in acetonitrile)

[JRC - IRMM link to the product](#)

ERM® - AC058 (Aflatoxin B2 in acetonitrile)

[JRC - IRMM link to the product](#)

ERM® - AC059 (Aflatoxin G1 in acetonitrile)

[JRC - IRMM link to the product](#)

ERM® - AC060 (Aflatoxin G2 in acetonitrile)

[JRC - IRMM link to the product](#)

IRMM - 315 (Deoxynivalenol in acetonitrile)

[JRC - IRMM link to the product](#)

ERM® - AC699 (Zearalenone in acetonitrile)

[JRC - IRMM link to the product](#)

BCR® - 262R (Defatted peanut meal Aflatoxin B1 blank)

[JRC - IRMM link to the product](#)

BCR® - 385R (Peanut butter - Aflatoxin high level)

[JRC - IRMM link to the product](#)

BCR® - 263R (Peanut meal containing Aflatoxin B1, B2, G1 and G2)

[JRC - IRMM link to the product](#)

BCR® - 264R (Defatted peanut meal containing Aflatoxin B1 at high level)

[JRC - IRMM link to the product](#)

BCR® - 375 (Compound feed Aflatoxin B1 blank)

[JRC - IRMM link to the product](#)

BCR® - 377 (Maize flour Deoxynivalenol blank)

[JRC - IRMM link to the product](#)

BCR® - 396 (Wheat flour Deoxynivalenol blank)

[JRC - IRMM link to the product](#)

BCR® - 471 (Wheat flour Ochratoxin A blank)

[JRC - IRMM link to the product](#)

ERM® - BC716 (Maize Zearalenone blank)

[JRC - IRMM link to the product](#)

ERM® - BC717 (Maize containing Zearalenone)

[JRC - IRMM link to the product](#)

ERM® - BD282 (Whole milk powder Aflatoxin M1 blank)

[JRC - IRMM link to the product](#)

ERM® - BD283 (Whole milk powder containing Aflatoxin M1 low level)

[JRC - IRMM link to the product](#)

ERM® - BD284 (Whole milk powder containing Aflatoxin M1 high level)

[JRC - IRMM link to the product](#)

SRM® 2387 (Peanut butter - reference values for Aflatoxins B1, B2, and total aflatoxins)

[NIST link to the product](#)

Materials characterised by proficiency testing providers

[FAPAS](#)

[Romerlabs](#)

Consumables

Elisa test kits and immunoaffinity clean-up columns IAC for various mycotoxins: [Tecna LAB](#), [Romerlabs](#), [R-Biopharm](#), [Grace Division](#), [Vicam](#), [Neogen](#), [Coring System Diagnostix GmbH](#), [Abraxis Bioscience](#)

"Monoclonal antibody-based indirect competitive ELISA for the detection of T-2 toxin in wheat, maize, and baby food"

[Biocop presentation of ELISA test kit](#)

Analytical methods

Table 7: Standardised methods for Mycotoxin determination in various matrices

Matrix	Method	Comments/links
Food	CEN/TR 16059:2010	Food analysis - Performance criteria for single laboratory validated methods of analysis for the determination of mycotoxins CEN technical report
Food	CR 13505:1999	Food analysis - Biotoxins - Criteria of analytical methods of mycotoxins CEN standards TC 275
Food	CEN/TR 15298:2006	Foodstuffs - Sample comminution for mycotoxins analysis - Comparison between dry milling and slurry mixing CEN standards TC 275
Food	EN ISO 14675:2003	Milk and milk products - Guidelines for a standardized description of competitive enzyme immunoassays - Determination of aflatoxin M1 content CEN standards TC 275
Food	ISO 14501:2007	Milk and milk powder -- Determination of aflatoxin M1 content -- Clean-up by immunoaffinity chromatography and determination by high-performance liquid chromatography ISO purchase page
Food	ISO 14674:2005	Milk and milk powder -- Determination of aflatoxin M1 content -- Clean-up by immunoaffinity chromatography and determination by thin-layer chromatography ISO purchase page
Food	EN 14123:2007	Foodstuffs - Determination of aflatoxin B1 and the sum of aflatoxin B1, B2, G1 and G2 in hazelnuts, peanuts, pistachios, figs, and paprika powder - High performance liquid chromatographic method with post-column derivatisation and immunoaffinity column cleanup CEN standards TC 275
Food	ISO 16050:2003	Foodstuffs -- Determination of aflatoxin B1, and the total content of aflatoxins B1, B2, G1 and G2 in cereals, nuts and derived products -- High-performance liquid chromatographic method ISO purchase page
Food	EN 12955:1999	Foodstuffs - Determination of aflatoxin B1, and the sum of aflatoxins B1, B2, G1 and G2 in cereals, shell-fruits and derived products - High performance liquid chromatographic method with post column derivatisation and immunoaffinity column clean up CEN standards TC 275
Food	2008.02 (AOAC Methods Adopted as First	Total Aflatoxins B1, B2, G1, and G2 and Ochratoxin A in Ginseng and Ginger by Multitoxin Immunoaffinity Column Cleanup and Liquid Chromatographic Quantitation

Matrix	Method	Comments/links
	Action Official Methods SM)	AOAC - link to list of official methods
Food	EN 15851:2010	Foodstuffs - Determination of aflatoxin B1 in cereal based foods for infants and young children - HPLC method with immunoaffinity column cleanup and fluorescence detection CEN standards TC 275
Feed	ISO 17375:2006	Animal feeding stuffs -- Determination of aflatoxin B1 ISO purchase page
Feed	ISO 6651:2001	Animal feeding stuffs -- Semi-quantitative determination of aflatoxin B1 -- Thin-layer chromatographic methods ISO purchase page
Feed	ISO 14718:1998	Animal feeding stuffs -- Determination of aflatoxin B1 content of mixed feeding stuffs -- Method using high-performance liquid chromatography ISO purchase page
Food	PVM 2: 1997 (AOAC peer-verified method)	Determination of Deoxynivalenol in White Flour, Whole Wheat Flour, and Bran by Solid-Phase Extraction/Liquid Chromatography AOAC - List of Approved peer-verified methods
Food	EN 15891:2010	Foodstuffs - Determination of deoxynivalenol in cereals, cereal products and cereal based foods for infants and young children - HPLC method with immunoaffinity column cleanup and UV detection CEN standard
Feed	EN 15791:2009	Animal feeding stuffs - Determination of Deoxynivalenol in animal feed - HPLC method with UV detection and immunoaffinity column clean-up CEN standards TC 327
Food	CEN/TS 16187:2011	Foodstuffs - Determination of fumonisin B1 and fumonisin B2 in processed maize containing foods for infants and young children - HPLC method with immunoaffinity column cleanup and fluorescence detection after precolumn derivatization CEN technical specification
Food	EN 14352:2004	Document title Foodstuffs - Determination of fumonisin B1 and B2 in maize based foods - HPLC method with immunoaffinity column clean up CEN standards TC 275
Food	EN 13585:2001	Foodstuffs - Determination of fumonisins B1 and B2 in maize - HPLC method with solid phase extraction clean-up CEN standards TC 275
Food	EN 14352:2004	Foodstuffs - Determination of Fumonisin B1 and B2 in maize based foods - HPLC method with immunoaffinity column clean up CEN standards TC 275
Food	EN 14133:2009	Foodstuffs - Determination of ochratoxin A in wine and beer - HPLC method with immunoaffinity column clean-up. CEN standards TC 275

Matrix	Method	Comments/links
Food	EN 15829:2010	Foodstuffs - Determination of ochratoxin A in currants, raisins, sultanas, mixed dried fruit and dried figs - HPLC method with immunoaffinity column cleanup and fluorescence detection CEN standards TC 275
Food	EN 15835:2010	Foodstuffs - Determination of ochratoxin A in cereal based foods for infants and young children - HPLC method with immunoaffinity column cleanup and fluorescence detection CEN standards TC 275
Food	EN ISO 15141-1:1998 EN ISO 15141-2:1998	Foodstuffs - Determination of ochratoxin A in cereals and cereal products - Part 1: High performance liquid chromatographic method with silica gel clean up Foodstuffs - Determination of ochratoxin A in cereals and cereal products - Part 2: High performance liquid chromatographic method with bicarbonate clean up CEN standards TC 275
Food	EN 14132:2009	Foodstuffs - Determination of ochratoxin A in barley and roasted coffee - HPLC method with immunoaffinity column clean-up CEN standards TC 275
Food	EN 14177:2003	Foodstuffs - Determination of Patulin in clear and cloudy apple juice and puree - HPLC method with liquid/liquid partition clean-up CEN standards TC 275
Food	EN 15890:2010	Foodstuffs - Determination of patulin in fruit juice and fruit based purée for infants and young children - HPLC method with liquid/liquid partition cleanup and solid phase extraction and UV detection CEN standard
Food	ISO 8128-1:1993	Apple juice, apple juice concentrates and drinks containing apple juice -- Determination of patulin content -- Part 1: Method using high-performance liquid chromatography ISO purchase page
Food	ISO 8128-2:1993	Apple juice, apple juice concentrates and drinks containing apple juice -- Determination of patulin content -- Part 2: Method using thin-layer chromatography ISO purchase page
Food	EN 15850:2010	Foodstuffs - Determination of zearalenone in maize based baby food, barley flour, maize flour, polenta, wheat flour and cereal based foods for infants and young children - HPLC method with immunoaffinity column cleanup and fluorescence detection CEN standards TC 275
Feed	EN 15792:2009	Animal feeding stuffs - Determination of zearalenone in animal feed - High performance liquid chromatographic method with fluorescence detection and immunoaffinity column clean-up CEN standards TC 327
Feed	ISO 17372:2008	Animal feeding stuffs -- Determination of zearalenone by

Matrix	Method	Comments/links
		immunoaffinity column chromatography and high performance liquid chromatography ISO purchase page
Feed	ISO 6870:2002	Animal feeding stuffs -- Qualitative determination of zearalenone ISO purchase page
Cereals	AACC approved methods 10 th edition	Chapter 45 is dedicated to analytical methods for mycotoxins. Access restricted to members AACC International approved methods
Food and feed	No Official Reference but reference to literature	EMAS - link to the method for Patulin
		EMAS - link to method for Ochratoxin A
		EMAS - link to method for Trichothecenes
		EMAS - link to method for Fumonisin
		EMAS - link to method for Zearalenon
		EMAS - link to method for Aflatoxins
Food and Feed		Various categories of information (toxicology, occurrence, analytical methods): BugWood
Food	AOAC Official Methods of Analysis - Chapter 49	Mycotoxins (Aflatoxins B1/B2/G1/G2, Aflatoxin M1, Deoxynivalenol, Ochratoxins, Patulin, Sterigmatocystin, Zearalenon)

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Abstract

This Technical Report of the European Union Reference Laboratory (EU-RLRL) for Mycotoxins aims to deliver useful scientific information to all laboratories dealing with mycotoxins determination in food, but also in other matrices.

Chemical data of the mycotoxins of concern, European legislation related to mycotoxins in food and feed and web-links to toxicological information on these compounds are reported. Also the occurrence and analytical methods are included. A long list of links to international organisations of general interest for analytical chemistry and food safety and of organisations of specific interest as well as some e-publications is included. Also links for books, international guidelines, proficiency test providers, standards and consumables suppliers can be found. From the first edition, links were checked and, when necessary, corrected; some information was added.

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