Extensive literature search for studies related to fumonisins and their modified forms

Nielsen, Elsa Ebbesen; Egebjerg, Mikael Mandrup; Olesen, Pelle Thonning; Sharma, Anoop Kumar; Nørby, Karin Kristiane; Beltoft, Vibe Meister; Rasmussen, Peter Have; Bredsdorff, Lea; Hansen, Max; Eriksen, Folmer Damsted

Published in:
EFSA Supporting Publications

Link to article, DOI:
10.2903/sp.efsa.2018.EN-1148

Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Extensive literature search for studies related to fumonisins and their modified forms

National Food Institute, Technical University of Denmark

Elsa Nielsen, Mikael Mandrup Egebjerg, Pelle Thonning Olesen, Anoop Kumar Sharma, Karin Nørby, Vibe Beltoft, Peter Have Rasmussen, Lea Bredsdorff, Max Hansen, Folmer Eriksen, Kirsten Pilegaard, Gitte Ravn-Haren and Kevin Jørgensen

Abstract

An extensive literature search to identify and collect all studies related to fumonisins and their modified forms was performed in the two databases PubMed and Web of Science for nine Areas. After combination of the searches from the two databases and removal of the duplicates, the total number of hits for Area 1 was 4456, for Area 2 was 2261, for Area 3 was 1649, for Area 4 was 3555, for Area 5 was 1632, for Area 6 was 2424, for Area 7 was 5087, for Area 8 was 3284, and for Area 9 was 3283. The evaluation of all retrieved references for relevance by screening the title and abstract (if available) and applying eligibility criteria (inclusion/exclusion) resulted in a total number of relevant references for Area 1 of 532, for Area 2 of 114, for Area 3 of 273, for Area 4 of 87, for Area 5 of 138, for Area 6 of 38, for Area 7 of 270, for Area 8 of 709, and for Area 9 of 270.

© European Food Safety Authority, 2018

Key words: fumonisins, toxicity, occurrence in food and feed, chemistry, extensive literature search

Question number: EFSA-Q-2016-00366
Correspondence: biocontam@efsa.europa.eu
Extensive literature search for fumonisins and their modified forms

Disclaimer: The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.


ISSN: 2397-8325

© European Food Safety Authority, 2018

Reproduction is authorised provided the source is acknowledged.
Summary

The overall aim of this assignment was to identify and collect all relevant literature related to fumonisins and their modified forms to support preparatory work for the human and animal risk assessment of these substances.

Initially, nine tailored search strings were designed to retrieve all potentially relevant studies within the following nine areas:

- **Area 1**: Data on chemistry and analysis (substance identification and characterisation, analytical detection and determination, formation).
- **Area 2**: Data on toxicokinetics (absorption, distribution, metabolism, excretion) in experimental animals, farm and companion animals, humans and from *in vitro* studies and on biomarkers.
- **Area 3**: Data on *in vitro* and *in vivo* mode of action (MoA) of toxicity.
- **Area 4**: Data on toxicity *in vivo* (e.g. acute, subacute, subchronic, chronic toxicity; genotoxicity, carcinogenicity, toxicity to specific organs) in laboratory animals.
- **Area 5**: Data on toxicity *in vitro*.
- **Area 6**: Data on observations in humans (e.g. epidemiological studies, case reports, intervention studies).
- **Area 7**: Data on adverse effects in farm and companion animals (studies in the different species e.g. ruminants, pigs, poultry, rabbits, fish, cats, dogs etc.).
- **Area 8**: Data on occurrence in food.
- **Area 9**: Data on occurrence in feed and animal exposure (including feed occurrence in the different feed commodities, feed intake and animal exposure).

The search strings were tailored to the databases PubMed and Web of Science and consisted of two major steps each designed to search titles and abstracts in PubMed and Web of Science, as well as full text in PubMed. Combinations of search terms were used, starting with a broad search for fumonisins and their modified forms, synonyms and abbreviations (step 1) and followed by an Area specific step with the addition of search terms relevant to each Area (step 2).

Then the nine tailored search strings were employed to retrieve all relevant studies from the two databases. Data published since year 2000 were retrieved for Area 1-6 and Area 8-9. Data published since year 1980 were retrieved for Area 7. All retrieved references were exported as separate files into EndNote™. Duplicate studies were then removed after combining the two EndNote™ files per Area into one single combined file per Area.

The total number of hits from each database, as well as the total number of hits (combined total) and total number of hits after removal of the duplicates (combined) are summarised in the table below.

<table>
<thead>
<tr>
<th>Area</th>
<th>PubMed</th>
<th>Web of Science</th>
<th>Combined total</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2209</td>
<td>4145</td>
<td>6354</td>
<td>4456</td>
</tr>
<tr>
<td>2</td>
<td>1531</td>
<td>1661</td>
<td>3192</td>
<td>2261</td>
</tr>
<tr>
<td>3</td>
<td>923</td>
<td>1551</td>
<td>2474</td>
<td>1649</td>
</tr>
<tr>
<td>4</td>
<td>1667</td>
<td>3272</td>
<td>4939</td>
<td>3555</td>
</tr>
<tr>
<td>5</td>
<td>796</td>
<td>1504</td>
<td>2300</td>
<td>1632</td>
</tr>
<tr>
<td>6</td>
<td>1748</td>
<td>1363</td>
<td>3111</td>
<td>2424</td>
</tr>
<tr>
<td>7</td>
<td>2966</td>
<td>4331</td>
<td>7297</td>
<td>5087</td>
</tr>
<tr>
<td>8</td>
<td>1823</td>
<td>3053</td>
<td>4876</td>
<td>3284</td>
</tr>
<tr>
<td>9</td>
<td>1755</td>
<td>3076</td>
<td>4831</td>
<td>3283</td>
</tr>
</tbody>
</table>

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.
All retrieved references were then evaluated for relevance by applying eligibility criteria (inclusion/exclusion). The selection for relevance was conducted by screening the title and abstract (if available) and all the retrieved studies were ultimately sorted into one of the following three categories:

- **Relevant to the research objectives**: References ultimately evaluated to be relevant were included in this category.
- **Maybe relevant to the research objectives**: In case the relevance could not be evaluated because e.g. of missing or vague abstracts or because the reference addressed and discussed mycotoxins in general and fumonisins could not be excluded based on the title and abstract of the reference, the references were included in this category, as a conservative approach.
- **Not relevant to the research objectives**: References ultimately evaluated not to be in-scope were included in this category.

The results of the reference selection process were reported in summary tables (Excel files), one table per Area. The summary tables include all pertinent information for each of the references in the 'Relevant' category as identified by the eligibility criteria and which could be retrieved from the title and abstract (when available). The summary tables also include references in the 'Maybe relevant' and the 'Not relevant' categories, but without any study details except for including the reason for exclusion for the 'Not relevant' references, i.e. not target compound or not relevant for the specific Area is presented.

The evaluation for relevance resulted in a total number of relevant references for Area 1 of 532, for Area 2 of 114, for Area 3 of 273, for Area 4 of 87, for Area 5 of 138, for Area 6 of 38, for Area 7 of 270, for Area 8 of 709, and for Area 9 of 270.
1. Introduction .................................................................................................................................................. 6
1.1. Background and Terms of Reference as provided by the requestor .................................................... 6
1.1.1. Background as provided by EFSA ..................................................................................................... 6
1.1.2. Objectives as provided by EFSA ...................................................................................................... 6
2. Methodologies .......................................................................................................................................... 7
2.1. Objective 1 ........................................................................................................................................... 7
2.1.1. Task 1 Developing tailored search strategies and search strings for collecting relevant studies 7
2.2. Objective 2 .......................................................................................................................................... 8
2.2.1. Task 2 Execution of the extensive literature searches using the tailored search strings developed in task 1 .......................................................................................................................... 8
2.2.2. Objective 3 .................................................................................................................................... 8
2.3. Task 3 Selection of all relevant studies retrieved by the extensive literature searches ..................... 8
3. Results ...................................................................................................................................................... 9
3.1. Objective 1 ....................................................................................................................................... 9
3.1.1. Task 1 Developing tailored search strategies and search strings for collecting relevant studies 9
3.2. Objective 2 ....................................................................................................................................... 11
3.2.1. Task 2 Execution of the extensive literature searches using the tailored search strings developed in task 1 .......................................................................................................................... 11
3.3. Objective 3 .................................................................................................................................... 12
3.3.1. Task 3 Selection of all relevant studies retrieved by the extensive literature searches ............... 12
4. Conclusions ............................................................................................................................................. 14
References .................................................................................................................................................. 14
Abbreviations ............................................................................................................................................. 15
Appendix A – Log file for the tailored search strings to retrieve all relevant data on fumonisins and their modified forms ....................................................................................................................... 16
Appendix B – Identified relevant references for each area ........................................................................ 21
1. **Introduction**

1.1. **Background and Terms of Reference as provided by the requestor**

This contract/grant was awarded by EFSA to:

Contractor: National Food Institute, Technical University of Denmark

Contract title: Extensive literature search for studies related to fumonisins and their modified forms

Contract number: RC/EFSA/BIOCONTAM/2016/03

1.1.1. **Background as provided by EFSA**

The Unit on Biological Hazard and Contaminants (BIOCONTAM Unit) supports the Panel on Contaminants in the Food Chain (CONTAM Panel), which provides scientific advice on contaminants in the food chain and undesirable substances such as natural toxicants, mycotoxins and residues of unauthorised substances.

In April 2015 EFSA received from the European Commission a mandate for a scientific opinion on the appropriateness to set a group health based guidance value for fumonisins and their modified forms (EFSA-Q-2015-00227) and a mandate for a scientific opinion on the risks for animal health related to the presence of fumonisins and their modified forms in feed (EFSA-Q-2015-00248). These mandates were allocated to the CONTAM Panel. Working Groups have been established to develop these scientific opinions.

To support preparatory work for the hazard identification and characterization steps in the human and animal risk assessment, EFSA wishes to outsource an extensive literature search (ELS) related to fumonisins and their modified forms.

The present Call is based on EFSA’s 2016 Work Programme for Grants and operational Procurements Financing Decision found in Annex II of the Programming Document 2016-2018, available on EFSA’s website.

1.1.2. **Objectives as provided by EFSA**

The overall aim of the assignment is to identify and collect all relevant literature related to fumonisins and their modified forms to support preparatory work for the human and animal risk assessment of these substances.

The three specific objectives in this assignment include:

**Objective 1:**

To design a tailored search strategy to retrieve all potentially relevant studies on fumonisins and their modified forms as defined by EFSA (2014) in the following areas:

- **Area 1:** Data on chemistry and analysis (substance identification and characterisation, analytical detection and determination, formation).
- **Area 2:** Data on toxicokinetics (absorption, distribution, metabolism, excretion) in experimental animals, farm and companion animals, humans and from *in vitro* studies and on biomarkers.
- **Area 3:** Data on *in vitro* and *in vivo* mode of action (MoA) of toxicity.
- **Area 4:** Data on toxicity *in vivo* (e.g. acute, subacute, subchronic, chronic toxicity; genotoxicity, carcinogenicity, toxicity to specific organs) in laboratory animals.
- **Area 5:** Data on toxicity *in vitro*.

---


The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.
Extensive literature search for fumonisins and their modified forms

- Area 6: Data on observations in humans (e.g. epidemiological studies, case reports, intervention studies).
- Area 7: Data on adverse effects in farm and companion animals (studies in the different species e.g. ruminants, pigs, poultry, rabbits, fish, cats, dogs etc.).
- Area 8: Data on occurrence in food.
- Area 9: Data on occurrence in feed and animal exposure (including feed occurrence in the different feed commodities, feed intake and animal exposure).

Objective 2:
To retrieve all potentially relevant studies for fumonisins and their modified forms by execution of an extensive literature search (ELS) using the tailored search strings for the nine areas developed under objective 1.

Objective 3:
To determine the relevance of the retrieved studies by screening titles and abstracts according to preselected eligibility criteria and prepare the outcome of the project for presentation to EFSA.

2. Methodologies

The methodology for systematic reviews including guidance for development and optimisation of a search strategy and for selecting relevant studies has been described by EFSA (2010). This methodology was implemented as appropriate in the Tasks described below.

2.1. Objective 1

2.1.1. Task 1 Developing tailored search strategies and search strings for collecting relevant studies

A tailored search string for each of the nine areas described above was developed for identifying all potentially relevant studies for the human and animal risk assessment of fumonisins and their modified forms.

The search strings are driven by eligibility criteria for each Area (1-9) developed by the Contractor and agreed with EFSA. The eligibility criteria contained both inclusion and exclusion criteria. The search strings were tailored to the databases PubMed and Web of Science. Therefore the search strings consisted of two major steps each designed to search titles and abstracts in PubMed and Web of Science, as well as full text in PubMed. Combinations of search terms were used. Use of the Boolean operator "NOT" is generally to be avoided as a relevant reference can contain discussions on both relevant and excluded search terms.

Step 1 consisted of a broad search for fumonisins and their modified forms, synonyms and abbreviations. The dominant fumonisins found as contaminants in food and feed belong to the B group (FB) and comprise FB1 to FB6. Modified forms of fumonisin B (FB) include hydrolysed fumonisin B (HFB), partially hydrolysed fumonisin B (PHFB), N-deoxyfructos-1-yl fumonisin B (NDF-FB) and N-carboxymethyl fumonisin B (NCM-FB) (EFSA 2014). The search strategies were designed to capture the fumonisin B group and their modified forms, as well as to capture other fumonisin groups (e.g. A, C and P) and their modified forms, if any.

Step 2 was Area specific with the addition of search terms relevant to each specific Area.

---

2 Including the following databases: Web of Science™ Core Collection, BIOSIS Citation IndexSM, CABI: CAB Abstracts®, Current Contents Connect®, Data Citation Index SM, FSTA®- the food science resource, MEDLINE®, ScIELO Citation Index and Zoological Recored®.
Extensive literature search for fumonisins and their modified forms

Search terms were identified in collaboration with the entire project team to identify as many relevant as possible. The search terms were developed in order to retrieve the largest number of potentially relevant studies on fumonisins and their modified forms within Area 1-9. The search strings were presented and discussed with EFSA at the kick-off meeting.

2.2. Objective 2

2.2.1. Task 2 Execution of the extensive literature searches using the tailored search strings developed in task 1

The tailored search strings developed in Task 1 and agreed upon by EFSA were employed to retrieve all relevant studies from the databases PubMed and Web of Science on fumonisins and their modified forms.

Data published since year 2000 were retrieved for Area 1-6 and Area 8-9. Data published since year 1980 were retrieved for Area 7.

All references located in the extensive literature searches in PubMed and Web of Science were exported as separate files into EndNote™. Title, author, journal, year of publication and abstract were included for each study imported to EndNote™ and the number of hits resulting from each of the tailored search strings in each of the two databases were recorded in a log file. Duplicate studies were then removed after combining the two EndNote™ files per Area into one single combined file per Area.

2.3. Objective 3

2.3.1. Task 3 Selection of all relevant studies retrieved by the extensive literature searches

All studies retrieved by the extensive literature searches and imported into the combined EndNote™ files, one file per Area (Task 2), were evaluated for relevance by applying eligibility criteria (inclusion/exclusion) for each subject Area (1-9) developed by the Contractor and agreed upon by EFSA. The selection for relevance was conducted by screening their title and abstract (if available) and all the retrieved studies were ultimately sorted into one of the following three categories:

- **Relevant to the research objectives**: References ultimately evaluated to be relevant were included in this category.
- **Maybe relevant to the research objectives**: In case the relevance could not be evaluated because e.g. of missing or vague abstracts or because the reference addressed and discussed mycotoxins in general and fumonisins could not be excluded based on the title and abstract of the reference, the references were included in this category, as a conservative approach.
- **Not relevant to the research objectives**: References ultimately evaluated not to be in-scope were included in this category.

To ensure a uniform understanding of the eligibility criteria in each Area, these were discussed in an internal meeting before all references were assessed for relevance.

According to the original protocol proposed by the Contractor, "Each reference will be individually assessed by two reviewers in order to prevent the introduction of errors and personal bias. In the possible event of disagreements between reviewers a third member of the project team will assist in solving the specific issue as recommended by EFSA (2010)." However, as a result of the very broad search strings for each Area, a huge number of irrelevant hits were retrieved in the ELS for each Area. Furthermore, as a result of the many Areas, a great number of references appeared in more than one area. It was therefore decided that one principal team member for each Area performed an initial sorting of the hits into one of the following four categories: 1) Relevant, 2) Maybe relevant, 3) Not relevant, and 4) to be further assessed. All the references in the fourth category ("to be further assessed") were then assessed by two reviewers to ensure consistency in the assessment.

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.
assessed’) were then evaluated by a principal team member eventually in collaboration with another

During the selection of relevance process the principal team member for a specific Area also identified

team member and the references were then included either in the ‘Relevant’, the ‘Maybe relevant’ or

references of potential relevance for other Areas. After the selection of relevance process was finalised

in the ‘Not relevant’ category. The project coordinator also assisted in this evaluation. In case

for each Area a cross check was made between one specific Area and all other Areas to ensure that all

relevance still remained uncertain, the references were included in the ‘Maybe relevant’ category, as a

relevant references have been captured for each Area. References that were identified in another Area

conservative approach. This deviation from the original protocol is not considered to invalidate the

/ other Areas as being potential relevant for the specific Area, but not retrieved in the Area specific

outcome of the selection for relevance of the studies retrieved from the ELSs because of the control

literature searches in PubMed and Web of Science were included in both the Area specific summary

measures and quality check taken in the execution of this task.

table (in an additional sheet) and in the Area Specific EndNote file (in a separate folder).

To ensure a uniform reporting in the summary tables, representative references within each Area

During the selection of relevance process the principal team member for a specific Area also identified

were assessed for relevance by all principal team members and discussed in an internal meeting

references were assessed for relevance. These described measures were implemented to

before all references were assessed for relevance. These described measures were implemented to

avoid the introduction of time-consuming mistakes.

The results of the reference selection process were reported in summary tables (Excel files), one table

The summary tables included all pertinent information from each of the relevant studies as

per Area. The summary tables included all pertinent information from each of the relevant studies as

identified by the eligibility criteria developed by the Contractor and agreed with EFSA. The information

in the summary tables ensures that all eligibility criteria of the studies were considered.

Additional fields for relevance (answered by yes/no based on the eligibility criteria), indication of other

potential Areas, the person(s) responsible for the screening and comments were also included in the

summary tables.

All references found relevant for the human and animal risk assessment of fumonisins and their

All relevant studies were collected in a reference list, one list per Area, see Appendix B.

3. Results

3.1. Objective 1

3.1.1. Task 1 Developing tailored search strategies and search strings for

The tailored search strings were developed in order to retrieve the largest number of potentially

collecting relevant studies

relevant studies for the human and animal risk assessment of fumonisins and their modified forms

within Area 1-9.

The proposed search strings were submitted to EFSA on 7 July 2016 (email) as part of Deliverable 1,

The search string for step 1 was developed in order to capture all known fumonisin groups (e.g. A, B,

and were discussed, revised and agreed with EFSA at the kick-off meeting on 11-12 July. The agreed

C and P) by using the search term fumonisin*. Regarding modified forms of fumonisins the search

search strings for Step 1 and Step 2, for Area 1-9 are presented below.

search terms have been restricted to include the known modified forms of the fumonisin B group defined in

The search strings for step 1, Area 2-6 were developed based on the experiences obtained in a similar

the EFSA CONTAM Panel (2014) opinion as modified forms of other fumonisin groups are not known

procurement recently carried out for EFSA ‘Identifying and collecting relevant literature related to the

Area 1-9.

The search strings for step 1 and step 2 are presented below.

The search strings for step 1 were developed in order to capture all known fumonisin groups (e.g. A, B,

C and P) by using the search term fumonisin*. Regarding modified forms of fumonisins the search

terms have been restricted to include the known modified forms of the fumonisin B group defined in

the EFSA CONTAM Panel (2014) opinion as modified forms of other fumonisin groups are not known

to the Contractor.

The search strings for step 2, Area 2-6 were developed based on the experiences obtained in a similar

procurement recently carried out for EFSA ‘Identifying and collecting relevant literature related to the


The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in

the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is

published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The

European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document,

without prejudice to the rights of the authors.
oral toxicity of furan and its methyl analogues, 2-methylfuran and 3-methylfuran, final report submitted to EFSA on 14 June 2016. In that procurement, the search terms were combined and tested in the databases PubMed and Web of Science to develop the most sensitive and appropriate search string. The search strings were also tested by assessing whether they retrieved relevant papers already known to the project team as recommended in EFSA (2010).

The search strings for step 2, Area 1 and 7-9 were deliberately developed as very broad and detailed in order to capture all potentially relevant data within these Areas. For Area 7, many of the search terms regarding farm and companion animal species were suggested as it is known to the Contractor that fumonisins cause adverse effects in these species; other search terms regarding species were suggested in order to achieve completeness regarding major farm and companion animal species. For Area 8 and 9, many of the search terms regarding food (Area 8) and feed (Area 9) were suggested as it is known to the Contractor that fumonisins have been detected in these foods/feeds; other search terms were suggested in order to achieve completeness regarding major foods/feeds.

In the proposed search strings, “OR” is the Boolean operator that expands the amount of references returned when used in a search string as just one of the search terms need to be present in the returned references. “*” symbolises truncation and is used for finding singular and plural forms of words and various endings. Both PubMed and Web of Science use an asterisk as their truncation symbol.

**Step 1:**

The search string agreed for step 1 is as follows:

- Fumonisin*
- OR HFB*
- OR PHFB*
- OR NDF-FB*
- OR NDF/FB*
- OR NCM-FB*
- OR NCM/FB*

**Step 2:**

The Area specific search strings agreed for step 2 are as follows:

**Area 1:** Data on chemistry and analysis (substance identification and characterisation, analytical detection and determination, formation).

*(Fusarium OR chem* OR analy* OR identi* OR charact* OR detect* OR determin* OR method* OR form* OR degrad* OR hydroly* OR reaction* OR GC* OR HPLC OR LC-MS OR ICP-MS)*

**Area 2:** Data on toxicokinetics (absorption, distribution, metabolism, excretion) in experimental animals, farm and companion animals, humans and from *in vitro* studies and on biomarkers.

*(in vitro OR absor* OR tissue* OR metaboli* OR excret* OR kinetic* OR toxicokinetic* OR pharmacokinetic* OR degrad* OR biotrans* OR eliminat* OR biomark*)

**Area 3:** Data on *in vitro* and *in vivo* mode of action (MoA) of toxicity.

*(in vitro OR in vivo OR mode OR action OR mechanism* OR glycol* OR sphingolipid* OR apoptosis OR oxidative)*

**Area 4:** Data on toxicity *in vivo* (e.g. acute, subacute, subchronic, chronic toxicity; genotoxicity, carcinogenicity, toxicity to specific organs) in laboratory animals.

*(in vivo OR acute OR chronic OR tox* OR genotox* OR muta* OR DNA OR damage OR repair OR clastogen* OR aneugen* OR chromosom* OR cancer* OR carcino* OR tumor* OR tumour* OR organ* OR tissue* OR immu* OR neuro* OR developmental OR teratogen* OR repro* OR liver OR...*
Area 5: Data on toxicity in vitro.

Area 6: Data on observations in humans (e.g. epidemiological studies, case reports, intervention studies).

Area 7: Data on adverse effects in farm and companion animals (studies in the different species e.g. ruminants, pigs, poultry, rabbits, fish, cats, dogs etc.).

Area 8: Data on occurrence in food.

Area 9: Data on occurrence in feed and animal exposure (including feed occurrence in the different feed commodities, feed intake and animal exposure).

3.2. Objective 2

3.2.1. Task 2 Execution of the extensive literature searches using the tailored search strings developed in task 1

The number of hits resulting from each of the tailored search strings in each of the two databases PubMed and Web of Science were recorded in a log file, see Appendix A.

The total number of hits from each database, as well as the total number of hits after removal of the duplicates (combined) are summarised in the table below. The duplicates in the combined file for each Area 1-9 were removed by the EndNote tool; however, duplicates may still be present in the combined...
The search terms NDF-FB*, NDF/FB* and NCM/FB* gave no hits in Web of Science and NDF-FB* gave no hits in PubMed. The search term GC* in the Area 1 search string gave no hits. The search term GC alone gave 88295 hits, which have been included in the final search for Area 1.

The results of the ELS on fumonisins and their modified forms for Area 1-9 were submitted to EFSA on 29 July (Interim report N2 by email, EndNote files uploaded to the DMS) as Deliverable 2.

For each of Area 1-9, three EndNote files were submitted: One including all hits from PubMed (named: My EndNote Library_AREA X_PubMed.enlx), one including all hits from Web of Science (named: My EndNote Library_AREA X_WoS.enlx), and one including the combined hits from PubMed and Web of Science with duplicate records removed (named: My EndNote Library_AREA X_combined.enlx).

### 3.3. Objective 3

#### 3.3.1. Task 3 Selection of all relevant studies retrieved by the extensive literature searches

The total number of relevant references for Area 1 was 532, for Area 2 114, for Area 3 273, for Area 4 87, for Area 5 138, for Area 6 38, for Area 7 270, for Area 8 709, and for Area 9 270.

The final protocol and project plan implemented by the Contractor to carry out the project was submitted to EFSA on 7 November (uploaded to the DMS and by email) as part of the draft final deliverable, the final version was submitted to EFSA on 21 November (uploaded to the DMS and by email), and the revised final version was submitted to EFSA on 2 December (uploaded to the DMS and by email) as part of the final deliverable.

### Summary tables

A proposal for the information (eligibility criteria) to be included in the summary tables for each area (combined pdf) was submitted to EFSA on 7 July (email) as part of Deliverable 1. The proposed summary tables were discussed with EFSA at the kick-off meeting on 11-12 July. EFSA had a few suggestions for revisions which were agreed at the kick-off meeting, and reflected in the revised version of the summary tables submitted to EFSA on 20 July (email), and again on 27 July (email).

Summary tables (Excel files) were prepared, one table for each Area 1-9. The summary tables include all pertinent information for each of the references in the ‘Relevant’ category as identified by the eligibility criteria suggested by the Contractor and agreed by EFSA, which could be retrieved from the title and abstract (when available).
Extensive literature search for fumonisins and their modified forms

According to the tender specifications, the summary tables should only include the relevant studies. However, for transparency reasons, it was agreed at the kick-off meeting also to include the ‘Maybe relevant’ and ‘Not relevant’ studies, but without any study details. For the ‘Not relevant’ studies, the reason for exclusion, i.e. not target compound or not relevant for the specific Area is presented. In addition, there is also an indication if a specific reference is considered of potential relevance for other Area(s).

All references included in the ‘Relevant’ category appear on a green background; all references included in the ‘Maybe relevant’ category appear on a yellow background; and all references included in the ‘Not relevant’ category appear on a white background. An additional sheet has been added in the summary tables for all Areas, except for Area 7. This additional sheet includes the references that were identified in another Area / other Areas as being potential relevant for the specific Area, but not retrieved in the Area specific literature searches in PubMed and Web of Science.

The summary tables were submitted to EFSA on 7 November (uploaded to the DMS) as part of the draft final deliverable and the final versions were submitted to EFSA on 21 November (uploaded to the DMS) as part of the final deliverable.

**EndNote™ files**

In the EndNote files, one file per Area (named: My EndNote Library_AREA X_deliverable 3.enlx), all hits were separated into 5 or 6 folders and named as follows:

- ‘Relevant’: Containing hits evaluated to be of relevance for this procurement
- ‘Maybe relevant’: Containing hits for which the relevance could not be evaluated because e.g. of missing or vague abstracts or because the reference addressed and discussed mycotoxins in general and fumonisins could not be excluded based on the title and abstract of the reference
- ‘Not relevant’: Containing hits evaluated not to be in-scope for this procurement
- ‘Relevant from other areas’: Containing hits evaluated to be of relevance for this procurement that were identified in another Area / other Areas than the specific Area, but not retrieved in the Area specific literature searches in PubMed and Web of Science.
- ‘May-be relevant from other areas’: Containing hits that may be relevant that were identified in another Area / other Areas that the specific Area, but not retrieved in the Area specific literature searches in PubMed and Web of Science.
- ‘Trash’: Containing the removed duplicates.

The EndNote files were submitted to EFSA on 7 November (uploaded to the DMS) as part of the draft final deliverable, the final versions were submitted to EFSA on 21 November (uploaded to the DMS), and the revised final versions were submitted to EFSA on 2 December (uploaded to the DMS) as part of the final deliverable.

**Reference lists**

All relevant references were collected in a reference list (Word file), one file per Area. The reference lists are included in Appendix B to this report.
4. Conclusions

An extensive literature search to identify and collect all studies related to fumonisins and their modified forms was performed in the two databases PubMed and Web of Science for nine Areas.

The total number of hits from each database, as well as the total number of hits (combined total) and total number of hits after removal of the duplicates (combined) are summarised in the table below.

<table>
<thead>
<tr>
<th>Area</th>
<th>PubMed</th>
<th>Web of Science</th>
<th>Combined total</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2209</td>
<td>4145</td>
<td>6354</td>
<td>4456</td>
</tr>
<tr>
<td>2</td>
<td>1531</td>
<td>1661</td>
<td>3192</td>
<td>2261</td>
</tr>
<tr>
<td>3</td>
<td>923</td>
<td>1551</td>
<td>2474</td>
<td>1649</td>
</tr>
<tr>
<td>4</td>
<td>1667</td>
<td>3272</td>
<td>4939</td>
<td>3555</td>
</tr>
<tr>
<td>5</td>
<td>796</td>
<td>1504</td>
<td>2300</td>
<td>1632</td>
</tr>
<tr>
<td>6</td>
<td>1748</td>
<td>1363</td>
<td>3111</td>
<td>2424</td>
</tr>
<tr>
<td>7</td>
<td>2966</td>
<td>4331</td>
<td>7297</td>
<td>5087</td>
</tr>
<tr>
<td>8</td>
<td>1823</td>
<td>3053</td>
<td>4876</td>
<td>3284</td>
</tr>
<tr>
<td>9</td>
<td>1755</td>
<td>3076</td>
<td>4831</td>
<td>3283</td>
</tr>
</tbody>
</table>

The evaluation of all retrieved references for relevance by screening the title and abstract (if available) and applying eligibility criteria (inclusion/exclusion) resulted in a total number of relevant references for Area 1 of 532, for Area 2 of 114, for Area 3 of 273, for Area 4 of 87, for Area 5 of 138, for Area 6 of 38, for Area 7 of 270, for Area 8 of 709, and for Area 9 of 270.

References


Abbreviations

DDGS  Dried Distillers Grains with Solubles
EFSA  European Food Safety Authority
ELS  Extensive literature search
FB  Fumonisin B
GC  Gas Chromatography
HFB  Hydrolysed fumonisin B
HPLC  High Performance Liquid Chromatography
ICP-MS  Inductively Coupled Plasma Mass Spectrometry
LC-MS  Liquid Chromatography Mass Spectrometry
MoA  Mode of Action
NCM-FB  N-carboxymethyl fumonisin B
NCM/FB  N-carboxymethyl fumonisin B
NDF-FB  N-deoxyfructos-1-yl fumonisin B
NDF/FB  N-deoxyfructos-1-yl fumonisin B
PHFB  Partially hydrolysed fumonisin B
WDG  Wet Distillers Grains
Appendix A – Log file for the tailored search strings to retrieve all relevant data on fumonisins and their modified forms

The search terms NDF-FB*; NDF/FB* and NCM/FB* gave no hits in Web of Science and NDF-FB* gave no hits in PubMed.

<table>
<thead>
<tr>
<th>Date of search</th>
<th>Substance name</th>
<th>Databases &amp; Search Engines</th>
<th>Search terms</th>
<th>Limitations applied to search</th>
<th>No of 'hits'</th>
<th>Comments &amp; follow-up actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 20, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (&quot;in vitro&quot; OR &quot;in vivo&quot; OR &quot;in vitro&quot; OR &quot;in vivo&quot; OR * OR absor* OR tissue* OR metabol* OR excret* OR kinetic* OR toxicokinetic* OR pharmacokinetic* OR degrad* OR biotrans* OR eliminat* OR biomark*)</td>
<td>Year: 2000-2018; Language: English</td>
<td>4145</td>
<td>AREA 1 [Comment: The search term GC* gave no hits. GC alone gave 88295 hits, which have been included in the final search] Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 20, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (&quot;in vitro&quot; OR &quot;in vivo&quot; OR * OR absor* OR tissue* OR metabol* OR excret* OR kinetic* OR toxicokinetic* OR pharmacokinetic* OR degrad* OR biotrans* OR eliminat* OR biomark*)</td>
<td>Year: 2000-2018; Language: English</td>
<td>1661</td>
<td>AREA 2</td>
</tr>
<tr>
<td>July 20, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (&quot;in vitro&quot; OR &quot;in vivo&quot; OR * OR absor* OR tissue* OR metabol* OR excret* OR kinetic* OR toxicokinetic* OR pharmacokinetic* OR degrad* OR biotrans* OR eliminat* OR biomark*)</td>
<td>Year: 2000-2018; Language: English</td>
<td>1551</td>
<td>AREA 3 [Has been exported to EndNote™]</td>
</tr>
<tr>
<td>July 20, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (&quot;in vitro&quot; OR * OR acute OR chronic OR tox* OR genotox* OR muta* OR DNA OR damage OR repair OR clastogen* OR aneugen* OR chromosom* OR cancer* OR carcin* OR tumor* OR tumour* OR organ* OR tissue* OR immun* OR neuro* OR developmental OR teratogen* OR repro* OR liver OR kidney* OR brain* OR lung* OR cardiovascular OR rat* OR mouse OR mice OR rabbit* OR hamster* OR primate* OR monkey*)</td>
<td>Year: 2000-2018; Language: English</td>
<td>3272</td>
<td>AREA 4 [Has been exported to EndNote™]</td>
</tr>
<tr>
<td>July 20, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (&quot;in vitro&quot; OR * OR acute OR chronic OR tox* OR genotox* OR muta* OR DNA OR damage OR repair OR clastogen* OR aneugen* OR chromosom* OR cancer* OR carcin* OR tumor* OR tumour* OR organ* OR tissue* OR immun* OR neuro* OR developmental OR teratogen* OR repro* OR liver OR kidney* OR brain* OR lung* OR cardiovascular OR rat* OR mouse OR mice OR rabbit* OR hamster* OR primate* OR monkey*)</td>
<td>Year: 2000-2018; Language: English</td>
<td>1504</td>
<td>AREA 5 [Has been exported to EndNote™]</td>
</tr>
</tbody>
</table>

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.
<table>
<thead>
<tr>
<th>Date of search</th>
<th>Substance name</th>
<th>Databases &amp; Search Engines</th>
<th>Search terms</th>
<th>Limitations applied to search</th>
<th>No of 'hits'</th>
<th>Comments &amp; follow-up actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 20, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (Fusarium OR concentration* OR occurrence OR food* OR diet* OR commod* OR fruit* OR pineapple OR &quot;Ananas comosus&quot; OR vegetable* OR garlic OR &quot;Allium sativum&quot; OR asparagus OR cereal* OR corn* OR maize OR &quot;Zea mays&quot; OR wheat OR &quot;Triticum aestivum&quot; OR rye OR &quot;Secale cereal&quot; OR barley OR &quot;Hordeum vulgare&quot; OR oat OR &quot;Avena sativa&quot; OR rice OR &quot;Oryza sativa&quot; OR soybean OR &quot;Glycine max&quot; OR sorghum OR sugarcane OR &quot;Saccharum officinarum&quot; OR millet OR &quot;Eleusine sp.&quot; OR &quot;Pennisetum glaucum&quot; OR starch OR flour OR bran OR germ OR dairy OR milk OR egg* OR meat OR liver OR kidney* OR offal OR coffee)</td>
<td>Language: English</td>
<td>4331</td>
<td>Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 21, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (Fusarium OR concentration* OR expos* OR work*)</td>
<td>Language: English</td>
<td>3053</td>
<td>AREA 8 Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 21, 2016</td>
<td>Fumonisin</td>
<td>Web of Science</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NCM-FB*) AND (Fusarium OR concentration* OR expos* OR work*)</td>
<td>Year: 2000-2016</td>
<td>3076</td>
<td>AREA 9 Has been exported to EndNote™</td>
</tr>
</tbody>
</table>

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.
<table>
<thead>
<tr>
<th>Date of search</th>
<th>Substance name</th>
<th>Databases &amp; Search Engines</th>
<th>Search terms</th>
<th>Limitations applied to search</th>
<th>No of 'hits'</th>
<th>Comments &amp; follow-up actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 21, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NDF-FB* OR NDF/FB* OR NCM-FB* OR NCM/FB*) AND (&quot;Fusarium&quot; OR chem* OR analy* OR identi* OR charact* OR detect* OR determin* OR method* OR form* OR degrad* OR hydroly* OR reaction* OR GC OR HPLC OR LC-MS OR ICP-MS)</td>
<td>Year: 2000-Language: English</td>
<td>2209</td>
<td>AREA 1 Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 28, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NDF-FB* OR NDF/FB* OR NCM-FB* OR NCM/FB*) AND (&quot;in vitro&quot; OR absor* OR tissue* OR metabol* OR excret* OR kinetic* OR toxicokinetic* OR pharmokinetic* OR degrad* OR biotrans* OR eliminat* OR biomark*)</td>
<td>Year: 2000-Language: English</td>
<td>1531</td>
<td>AREA 2 Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 26, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NDF-FB* OR NDF/FB* OR NCM-FB* OR NCM/FB*) AND (&quot;in vivo&quot; OR acute OR chronic OR tox* OR genotox* OR muta* OR DNA OR damage OR repair OR clastogen* OR aneugen* OR chromosom* OR cancer* OR cardio* OR tumor* OR tumour* OR organ* OR tissue* OR immun* OR neuro* OR developmental OR teratogen* OR repro* OR liver OR kidney* OR brain* OR lung* OR cardiovascular OR rat* OR mouse OR mice OR rabbit* OR hamster* OR primate* OR monkey*)</td>
<td>Year: 2000-Language: English</td>
<td>1667</td>
<td>AREA 4 Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 26, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>(Fumonisin* OR HFB* OR PHFB*)</td>
<td>Year: 2000-</td>
<td>796</td>
<td>AREA 5</td>
</tr>
</tbody>
</table>

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.
<table>
<thead>
<tr>
<th>Date of search</th>
<th>Substance name</th>
<th>Databases &amp; Search Engines</th>
<th>Search terms</th>
<th>Limitations applied to search</th>
<th>No of 'hits'</th>
<th>Comments &amp; follow-up actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 26, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NDF-FB* OR NCM-FB* OR NCM/FB*) AND (epidemi* OR intervention OR exposure* OR case* OR poison* OR cohort* OR cross-sectional OR random* OR work*)</td>
<td>Language: English</td>
<td>1748</td>
<td>Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 28, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NDF-FB* OR NCM-FB*) AND (tox* OR poison* OR cancer* OR carcino* OR tumor* OR tumour* OR organ* OR tissue* OR immun* OR neuro* OR developmental OR teratogen* OR repro* OR liver OR kidney* OR brain* OR lung* OR cardiovascular OR health OR clinical OR growth OR weight OR “farm animals” OR horse* OR stallion* OR mare* OR foal* OR equine OR ruminant* OR livestock OR herd OR cow* OR cattle OR bull* OR calf OR calves OR heifer* OR bovine OR sheep* OR ewe* OR ram* OR lamb OR goat* OR caprine OR ovine OR pig* OR swine* OR sow* OR gilt* OR boar* OR porcine OR mink* OR poultry OR chicken* OR hen* OR cock* OR rooster* OR broiler* OR duck* OR goose OR geese OR geesling* OR turkey* OR quail* OR guinea OR rabbit* OR fish* OR salmon OR trout OR piscine OR zebrafish OR pet* OR cat* OR kitten* OR dog* OR bitch* OR puppy*)</td>
<td>Year: 2000-</td>
<td>2966</td>
<td>AREA 7 Has been exported to EndNote™</td>
</tr>
<tr>
<td>July 25, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>(Fumonisin* OR HFB* OR PHFB* OR NDF-FB* OR NDF/FB* OR NCM-FB* OR NCM/FB*) AND (Fusarium* OR “in vitro” OR cytotox* OR genotox* OR muta* OR DNA OR damage OR repair OR clastogen* OR aneugen* OR “farm animals” OR horse* OR stallion* OR mare* OR foal* OR equine OR ruminant* OR livestock OR herd OR cow* OR cattle OR bull* OR calf OR calves OR heifer* OR bovine OR sheep* OR ewe* OR ram* OR lamb OR goat* OR caprine OR ovine OR pig* OR swine* OR sow* OR gilt* OR boar* OR porcine OR mink* OR poultry OR chicken* OR hen* OR cock* OR rooster* OR broiler* OR duck* OR goose OR geese OR geesling* OR turkey* OR quail* OR guinea OR rabbit* OR fish* OR salmon OR trout OR piscine OR zebrafish OR pet* OR cat* OR kitten* OR dog* OR bitch* OR puppy*)</td>
<td>Year: 1980-</td>
<td>1823</td>
<td>AREA 8 Has been exported to EndNote™</td>
</tr>
</tbody>
</table>

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.
### Extensive literature search for fumonisins and their modified forms

<table>
<thead>
<tr>
<th>Date of search</th>
<th>Substance name</th>
<th>Databases &amp; Search Engines</th>
<th>Search terms</th>
<th>Limitations applied to search</th>
<th>No of 'hits'</th>
<th>Comments &amp; follow-up actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 25, 2016</td>
<td>Fumonisin</td>
<td>PubMed</td>
<td>“Saccharum officinarum” OR millet OR “Eleusine sp.” OR “Pennisetum glaucum” OR starch OR flour OR bran OR germ OR dairy OR milk OR egg* OR meat OR liver OR kidney* OR offal OR coffee) (Fumonisin* OR HFB* OR PHFB* OR NDF-FB* OR NDF/FB* OR NCM-FB* OR NCM/FB*) AND (Fusarium OR concentration* OR expos* OR occurrence OR intake OR feed* OR fodder OR diet* OR meal OR cereal* OR corn OR maize OR “Zea mays” OR wheat OR “Triticum aestivum” OR rye OR “Secale cereal” OR barley OR “Hordeum vulgare” OR oat OR “Avena sativa” OR grain* OR seed* OR forage OR silage OR grass OR Poaceae OR hay OR rape OR “Raptio” OR “Brassica napus” OR soybean OR “Glycine max” OR DDGS OR WDG OR (dried AND distillers AND grains AND with AND solubles) OR (wet AND distillers AND grain))</td>
<td>Year: 2000-2017 Language: English</td>
<td>1755</td>
<td>AREA 9 Has been exported to EndNote™</td>
</tr>
</tbody>
</table>
Appendix B – Identified relevant references for each area

Appendix B contains the systematic review of the relevant literature. Versions in excel format are available for all nine areas in the online version of this output (in the “Supporting information” section): http://dx.doi.org/10.2903/sp.efsa.2018.EN-1148

AREA 1 CHEMISTRY AND ANALYSIS

Reference list with all relevant references identified for AREA 1: Data on chemistry and analysis (substance identification and characterisation, analytical detection and determination, formation) published in English since year 2000.

Relevant references retrieved in the literature searches for Area 1 CHEMISTRY AND ANALYSIS:


Extensive literature search for fumonisins and their modified forms


Bansal, J.; Pantazopoulos, P.; Tam, J.; Cavlovic, P.; Kwong, K.; Turcotte, A. M.; Lau, B. P. Y.; Scott, P.

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.


Bergmann, D.; Hubner, F.; Humph, H. U., 2013. Stable isotope dilution analysis of small molecules...


Bian, Y. N.; Huang, X. Y.; Ren, J. C., 2016. Sensitive and homogenous immunoassay of fumonisin in foods using single molecule fluorescence correlation spectroscopy, Analytical Methods, 8, 1333-1338.


Ezekiel, C. N.; Abia, W. A.; Ogara, I. M.; Sulyok, M.; Warth, B.; Kraska, R., 2015. Fate of mycotoxins in two popular traditional cereal-based beverages (kunu-zaki and pito) from rural nigeria, Lwt-Food Science and Technology, 60, 137-141.


Fernandes, P. J.; Barros, N.; Santo, J. L.; Camara, J. S., 2015. High-throughput analytical strategy based on modified quechers extraction and dispersive solid-phase extraction clean-up followed by liquid chromatography-triple-quadrupole tandem mass spectrometry for quantification of multiclass mycotoxins in cereals, Food Analytical Methods, 8, 841-856.


Guo, W. B.; Han, Z.; Yang, J. H.; Rao, Q. X.; Zhao, Z. H., 2016. Simultaneous preparation and characterization of three high-purity type b fumonisins from maize culture, Analytical Methods, 8, 2737-2742.


fumonisin b1, Analytica Chimica Acta, 414, 61-69.


Extensive literature search for fumonisins and their modified forms

Control, 54, 208-215.


Li, R. J.; Tao, B.; Pang, M. H.; Liu, Y. C.; Dong, J. G., 2015. Natural occurrence of fumonisins b-1 and b-2 in maize from three main maize-producing provinces in china, Food Control, 50, 838-842.


Lino, C. M.; Silva, L. J. G.; Pena, A. L. S.; Silveira, M. I., 2006. Determination of fumonisins b1 and b2 in portuguese maize and maize-based samples by hplc with fluorescence detection, Analytical and Bioanalytical Chemistry, 384, 1214-1220.


Extensive literature search for fumonisins and their modified forms


Molinie, A.; Faucet, V.; Castegnaro, P.; Pfohl-Leszkowicz, A., 2005. Analysis of some breakfast cereals on the french market for their contents of ochratoxin a, citrinin and fumonisin b-1: Development of a method for simultaneous extraction of ochratoxin a and citrinin, Food Chemistry, 92, 391-400.


blueberries, Mycotoxin Research, 30, 221-229.


Nkwe, D. O.; Taylor, J. E.; Siame, B. A., 2005. Fungi, aflatoxins, fumonisin b-1 and zearalenone contaminating sorghum-based traditional malt, wort and beer in botswana, Mycopathologia, 160,
Extensive literature search for fumonisins and their modified forms

177-186.


Oh, K. S.; Scott, P. M.; Chung, S. H., 2009. Incomplete recoveries of fumonisins present in naturally contaminated corn foods from an immunoaffinity column, J AOAC Int, 92, 496-501.


Oruc, H. H.; Cengiz, M.; Kalkanli, O., 2006. Comparison of aflatoxin and fumonisin levels in maize grown in turkey and imported from the USA, Animal Feed Science and Technology, 128, 337-341.


Park, J. W.; Scott, P. M.; Lau, B. P. Y., 2013. Analysis of n-fatty acyl fumonisins in alkali-processed corn foods, Food Science and Biotechnology, 22, 147-152.


Petersen, A.; Thorup, I., 2001. Preliminary evaluation of fumonisins by the nordic countries and occurrence of fumonisins (fb1 and fb2) in corn-based foods on the danish market, Food Addit Contam, 18, 221-226.


Pietri, A.; Bertuzzi, T., 2012. Simple phosphate buffer extraction for the determination of fumonisins in masa, maize, and derived products, Food Analytical Methods, 5, 1088-1096.


Reinholds, I.; Pugajeva, I.; Bartkevics, V., 2016. A reliable screening of mycotoxins and pesticide residues in paprika using ultra-high performance liquid chromatography coupled to high resolution orbitrap mass spectrometry, Food Control, 60, 683-689.


Communications in Mass Spectrometry, 29, 2131-2139.


Schmidt-Heydt, M.; Geisen, R., 2007. A microarray for monitoring the production of mycotoxins in...


859.


Shephard, G. S.; Sewram, V., 2004. Determination of the mycotoxin fumonisin b-1 in maize by reversed-phase thin-layer chromatography: A collaborative study, Food Additives and
Extensive literature search for fumonisins and their modified forms


Szabo-Fodor, J.; Bors, I.; Szabo, A.; Kovacs, M., 2016. Comparison of the amount of bioaccessible
fumonisin b1 and b2 in maize and rice inoculated with fusarium verticillioides (mrc 826) and determined by in vitro digestion-preliminary results, Mycotoxin Res, 32, 173-178.


Extensive literature search for fumonisins and their modified forms

Lemna minor l, J Nat Toxins, 9, 103-112.


Wang, Z.; Li, H.; Li, C.; Yu, Q.; Shen, J.; De Saeger, S., 2014. Development and application of a quantitative fluorescence-based immunochromatographic assay for fumonisin b1 in maize, J Agric
Extensive literature search for fumonisins and their modified forms


Wei, T.; Zhu, W.; Pang, M.; Liu, Y.; Dong, J., 2013. Natural occurrence of fumonisins b1 and b2 in corn in four provinces of china, Food Addit Contam Part B Survell, 6, 270-274.


Relevant reference not retrieved in the literature searches for Area 1 CHEMISTRY AND ANALYSIS:

AREA 2 TOXICOKINETICS

Reference list with all relevant references identified for AREA 2: Data on toxicokinetics (absorption, distribution, metabolism, excretion) in experimental animals, farm and companion animals, humans and from in vitro studies and on biomarkers published in English since year 2000.

Relevant references retrieved in the literature searches for Area 2 TOXICOKINETICS:


Domijan, A. M.; Peraica, M.; Markov, K.; Fuchs, R., 2009. Urine ochratoxin a and sphinganine/sphingosine ratio in residents of the endemic nephropathy area in croatia, Arh Hig Rada Toksikol, 60, 387-393.


Extensive literature search for fumonisins and their modified forms


Shirima, ; Tu, Y. K., 2015. A prospective study of growth and biomarkers of exposure to aflatoxin and fumonisin during early childhood in tanzania (vol 123, pg 173, 2015), Environmental Health Perspectives, 123, A32-A32.


Solfrizzo, M.; Gambacorta, L.; Lattanzio, V. M. T.; Powers, S.; Visconti, A., 2011. Simultaneous lc­ms/ms determination of aflatoxin m-1, ochratoxin a, deoxynivalenol, de-epoxydeoxynivalenol,
alpha and beta-zearalenols and fumonisin b-1 in urine as a multi-biomarker method to assess exposure to mycotoxins, Analytical and Bioanalytical Chemistry, 401, 2831-2841.


Szabo-Fodor, J.; Bors, I.; Szabo, A.; Kovacs, M., 2016. Comparison of the amount of bioaccessible fumonisin b1 and b2 in maize and rice inoculated with fusarium verticillioides (mrc 826) and determined by in vitro digestion-preliminary results, Mycotoxin Res, 32, 173-178.


Relevant references not retrieved in the literature searches for Area 2:

Evaluation of certain mycotoxins in food. Fifty-sixth report of the joint fao/who expert committee on

Oliveira, C. A. F., 2015. Evaluation of fumonisin exposure by determination of fumonisin b-1 in

b1 contamination in breast milk and its exposure in infants under 6 months of age in rombo,

Chen, G.; Lin, W. Y.; Shephard, G. S.; Taylor, P. R.; Fan, J. H.; Dawson, S. M.; Qiao, Y. L.;
chinese cohorts, Food and Chemical Toxicology, 50, 679-683.
AREA 3 MODE OF ACTION

Reference list with all relevant references identified for AREA 3: Data on in vitro and in vivo mode of action (MoA) of toxicity published in English since year 2000.

Relevant references retrieved in the literature searches for Area 3 MODE OF ACTION:

Abdel Nour, A. M.; Ringot, D.; Gueant, J. L.; Chango, A., 2007. Folate receptor and human reduced folate carrier expression in hepg2 cell line exposed to fumonisin b1 and folate deficiency, Carcinogenesis, 28, 2291-2297.


Burenjargal, M.; Lee, Y. S.; Yoo, J. M.; Choi, M. H.; Ji, S. Y.; Lee, Y. M.; Kim, Y. C.; Oh, S.; Yun, Y. P.; Yoo, H. S., 2008. Dihydroporosideramide was highly elevated by the fumonisin b(1) and desipramine in sphingononas chungbukensis, Biomolecules & Therapeutics, 16, 100-105.


Condresco, M.; Reeves, J. P., 2003. Fumonisin b1, an inhibitor of sphingolipid biosynthesis, activates the cardiac Na+/Ca2+ exchanger expressed in cho cells, Biophysical Journal, 84, 190A-191A.


Cortinovis, C.; Caloni, F.; Schreiber, N. B.; Spicer, L. J., 2014. Effects of fumonisin b-1 alone and combined with deoxynivalenol or zearalenone on porcine granulosa cell proliferation and steroid production, Theriogenology, 81, 1042-1049.


Devreese, M.; De Backer, P.; Croubels, S., 2013. Overview of the most important mycotoxins for the pig and poultry husbandry, Vlaams Diergeneeskundig Tijdschrift, 82, 171-180.

Devriendt, B.; Gallois, M.; Verdonck, F.; Wache, Y.; Bimczok, D.; Oswald, I. P.; Goddeeris, B. M.; Cox, E., 2009. The food contaminant fumonisin b-1 reduces the maturation of porcine cd11r1(+) intestinal antigen presenting cells and antigen-specific immune responses, leading to a prolonged intestinal etec infection, Veterinary Research, 40.


Extensive literature search for fumonisins and their modified forms


Gelderblom, W. C. A.; Moritz, W.; Swanevelder, S.; Smuts, C. M.; Abel, S., 2002. Lipids and delta 6-desaturase activity alterations in rat liver microsomal membranes induced by fumonisin b1, Lipids, 37, 869-877.


He, Q.; Kim, J.; Sharma, R. P., 2005. Fumonisin b1 hepatotoxicity in mice is attenuated by depletion of kupffer cells by gadolinium chloride, Toxicology, 207, 137-147.

He, Q.; Riley, R. T.; Sharma, R. P., 2005. Myriocin prevents fumonisin b-1-induced sphingoid base accumulation in mice liver without ameliorating hepatotoxicity, Food and Chemical Toxicology, 43, 969-979.


He, Q. R.; Kim, J.; Sharma, R. P., 2004. Silymarin protects against liver damage in balb/c mice exposed to fumonisin b-1 despite increasing accumulation of free sphingoid bases, Toxicological Sciences, 80, 335-342.


He, Q. R.; Sharma, R. P., 2005. Inhibition of tumor necrosis factor alpha signaling by anti-tumor necrosis factor alpha antibodies and pentoxifylline is unable to prevent fumonisin hepatotoxicity in mice, Toxicon, 46, 404-413.

He, Q. R.; Suzuki, H.; Sharma, R. P., 2006. S-adenosylmethionine or 5 '-methylthioadenosine are unable to prevent fumonisin b-1 hepatotoxicity in mice despite increased oxidation in liver, Journal of Applied Toxicology, 26, 509-516.


arginosuccinate synthetase using fumonisin affinity chromatography and in vitro kinetic studies, Journal of Biochemical and Molecular Toxicology, 14, 320-328.


Klaric, M. S.; Pupelnjak, S.; Domjan, A. M.; Petrik, J., 2007. Lipid peroxidation and glutathione levels in porcine kidney pk15 cells after individual and combined treatment with fumonisin b-1, beaurevinic and ochratoxin a, Basic & Clinical Pharmacology & Toxicology, 100, 157-164.


Marnewick, J. L.; van der Westhuizen, F. H.; Joubert, E.; Swanevelder, S.; Swart, P.; Gelderblom, W. C. A., 2009. Chemoprotective properties of rooibos (aspalathus linearis), honeybush (cyclopia intermedia) herbal and green and black (camellia sinensis) teas against cancer promotion induced by fumonisin b-1 in rat liver, Food and Chemical Toxicology, 47, 220-229.


Mary, V. S.; Valdehita, A.; Navas, J. M.; Rubinstein, H. R.; Fernandez-Cruz, M. L., 2015. Effects of aflatoxin b-1, fumonisin b-1 and their mixture on the aryl hydrocarbon receptor and cytochrome p450 1a induction, Food and Chemical Toxicology, 75, 104-111.
Extensive literature search for fumonisins and their modified forms


Meca, G.; Ruiz, M. J.; Fernandez-Franzon, M.; Ritiieni, A.; Manes, J., 2010. Isolation, purification, lc-ms/ms characterization and reactive oxygen species induced by fumonisin b-1 in vero cells, Food and Chemical Toxicology, 48, 2891-2897.


Muller, S.; Dekant, W.; Mally, A., 2012. Fumonisin b-1 and the kidney: Modes of action for renal tumor formation by fumonisin b-1 in rodents, Food and Chemical Toxicology, 50, 3833-3846.


The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.


Osborne, C. D.; Noblet, G. P.; Enongene, E. N.; Bacon, C. W.; Riley, R. T.; Voss, K. A., 2002. Host resistance to trypanosoma cruzi infection is enhanced in mice fed fusarium verticillioides (= f-moniiforme) culture material containing fumonisins, Food and Chemical Toxicology, 40, 1789-1798.

Osuchowski, M. F.; Edwards, G. L.; Sharma, R. P., 2005. Fumonisin b-1-induced neurodegeneration in mice after intracerebroventricular infusion is concurrent with disruption of sphingolipid metabolism and activation of proinflammatory signaling, Neurotoxicology, 26, 211-221.


Extensive literature search for fumonisins and their modified forms


Sharma, R. P.; He, Q. R.; Riley, R. T., 2005. Lupus-prone nzbf1/j mice, defective in cytokine signaling, are resistant to fumonisin hepatotoxicity despite accumulation of liver sphinganine, Toxicology, 216, 59-71.

Sharma, R. P.; He, Q.; Johnson, V. J.; Suzuki, H., 2006. Mice lacking both tnf alpha receptors show increased constitutive expression of ifn gamma: A possible reason for lack of protection from fumonisin b-1 hepatotoxicity, Cytokine, 34, 260-270.


Stockmann-Juvala, H.; Alenius, H.; Savolainen, K., 2008. Effects of fumonisin b-1 on the expression of cytokines and chemokines in human dendritic cells, Food and Chemical Toxicology, 46, 1444-1451.


Suzuki, H.; Riley, R. T.; Sharma, R. P., 2007. Inducible nitric oxide has protective effect on fumonisin b-1 hepatotoxicity in mice via modulation of sphingosine kinase, Toxicology, 229, 42-53.


Voss, K. A.; Riley, R. T.; Gelineau-van Waes, J., 2014. Fumonisin b-1 induced neural tube defects were not increased in lm/bc mice fed folate-deficient diet, Molecular Nutrition & Food Research, 58, 1190-1198.


Extensive literature search for fumonisins and their modified forms


Relevant references not retrieved in the literature searches for Area 3 MODE OF ACTION:


Halloy, D. J.; Gustin, P. G.; Bouhet, S.; Oswald, I. P., 2005. Oral exposure to culture material extract containing fumonisins predisposes swine to the development of pneumonitis caused by pasteurellumultocida, Toxicology, 213, 34-44.


Lalles, J. P.; Lessard, M.; Oswald, J. P.; David, J. C., 2010. Consumption of fumonisin b-1 for 9 days induces stress proteins along the gastrointestinal tract of pigs, Toxicon, 55, 244-249.


Extensive literature search for fumonisins and their modified forms


Stockmann-Juvala, H.; Savolainen, K., 2001. Caspase-3 activation and decreased levels of glutathione in mouse gt1-7 hypothalamic cells exposed to fumonisin b1, Toxicology, 164, 176-177.


REFERENCE LIST WITH ALL RELEVANT REFERENCES IDENTIFIED FOR AREA 4: DATA ON TOXICITY (E.G. ACUTE, SUBACUTE, SUBCHRONIC, CHRONIC TOXICITY; GENOTOXICITY, CARCINOGENICITY, TOXICITY TO SPECIFIC ORGANS) IN LABORATORY ANIMALS PUBLISHED IN ENGLISH SINCE YEAR 2000.

RELEVANT REFERENCES RETRIEVED IN THE LITERATURE SEARCHES FOR AREA 4 IN VIVO TOXICITY:


He, Q. R.; Kim, H.; Sharma, R. P., 2005. Fumonisin b-1 hepatotoxicity in mice is attenuated by depletion of kupffer cells by gadolinium chloride, Toxicology, 207, 137-147.


Kouadio, J. H.; Moukha, S.; Brou, K.; Gnaki, D., 2013. Lipid metabolism disorders, lymphocytes cells death, and renal toxicity induced by very low levels of deoxynivalenol and fumonisin b1 alone or in combination following 7 days oral administration to mice, Toxicol Int, 20, 218-223.

Lalles, J. P.; Lessard, M.; Oswald, I. P.; David, J. C., 2010. Consumption of fumonisin b-1 for 9 days induces stress proteins along the gastrointestinal tract of pigs, Toxicin, 55, 244-249.


Osborne, C. D.; Noblet, G. P.; Enongene, E. N.; Bacon, C. W.; Riley, R. T.; Voss, K. A., 2002. Host resistance to trypanosoma cruzi infection is enhanced in mice fed fusarium verticillioides (= f-moniliforme) form culture material containing fumonisins, Food and Chemical Toxicology, 40, 1789-1798.


Extensive literature search for fumonisins and their modified forms


Voss, K. A.; Riley, R. T.; Gelineau-van Waes, J., 2014. Fumonisin b-1 induced neural tube defects were not increased in lm/bc mice fed folate-deficient diet, Molecular Nutrition & Food Research, 58, 1190-1198.


Relevant reference not retrieved in the literature searches for Area 4 IN VIVO TOXICITY:

**AREA 5 IN VITRO TOXICITY**

Reference list with all relevant references identified for AREA 5: Data on toxicity *in vitro* published in English since year 2000.

**Relevant references retrieved in the literature searches for Area 5 IN VITRO TOXICITY:**

Abdel Nour, A. M.; Ringot, D.; Gueant, J. L.; Chango, A., 2007. Folate receptor and human reduced folate carrier expression in hepg2 cell line exposed to fumonisin b1 and folate deficiency, Carcinogenesis, 28, 2291-2297.


Chuturgoon, A.; Phulukdaree, A.; Moodley, D., 2014. Fumonisin b-1 induces global DNA hypomethylation and modulates cytochrome p-450 1b1 (cyp1b1) by repressing mir-27b in hepg2 cells, Toxicology Letters, 229, S147-S147.


Extensive literature search for fumonisins and their modified forms


Domijan, A. M.; Gajski, G.; Jovanovic, I. N.; Genic, M.; Garaj-Vrhovac, V., 2015. In vitro genotoxicity of mycotoxins ochratoxin a and fumonisin b-1 could be prevented by sodium copper chlorophyllin - implication to their genotoxic mechanism, Food Chemistry, 170, 455-462.


Galvano, F.; Campisi, A.; Russo, A.; Galvano, G.; Palumbo, M.; Renis, M.; Barcellona, M. L.; Perez-Polo, J. R.; Vanella, A., 2002. DNA damage in astrocytes exposed to fumonisin b-1, Neurochemical Research, 27, 345-351.

Galvano, F.; Russo, A.; Cardile, V.; Galvano, G.; Vanella, A.; Renis, M., 2002. DNA damage in human fibroblasts exposed to fumonisin b-1, Food and Chemical Toxicology, 40, 25-31.


Klaric, M. S.; Pepeljnjak, S.; Domijan, A. M.; Petrik, J., 2007. Lipid peroxidation and glutathione levels in porcine kidney pk15 cells after individual and combined treatment with fumonisin b-1, beauvericin and ochratoxin a, Basic & Clinical Pharmacology & Toxicology, 100, 157-164.


Lei, M. Y.; Zhang, N. Y.; Qi, D. S., 2013. In vitro investigation of individual and combined cytotoxic effects of aflatoxin b1 and other selected mycotoxins on the cell line porcine kidney 15, Experimental and Toxicologic Pathology, 65, 1149-1157.


Meca, G.; Ruiz, M. J.; Fernandez-Franzon, M.; Ritieni, A.; Manes, J., 2010. Isolation, purification, lc­ms/ms characterization and reactive oxygen species induced by fumonisin b-1 in vero cells, Food and Chemical Toxicology, 48, 2891-2897.


Myburg, R. B.; Dutton, M. F.; Chuturgoon, A. A., 2002. Cytotoxicity of fumonisin b-1, diethylnitrosamine, and catechol on the sno esophageal cancer cell line, Environmental Health Perspectives, 110, 813-815.


Osuchowski, M. F.; Sharma, R. P., 2005. Fumonisin b-1 causes necrotic cell death in bv-2 and murine cultured astrocytes and inhibits proliferation in bv-2 cells but n2a and primary cortical neurons are not affected, Faseb Journal, 19, A1078-A1078.

Osuchowski, M. F.; Sharma, R. P., 2005. Fumonisin b-1 induces necrotic cell death in bv-2 cells and murine cultured astrocytes and is antiproliferative in bv-2 cells while n2a cells and primary cortical neurons are resistant, Neurotoxicology, 26, 981-992.


Tajima, O.; Schoen, E. D.; Feron, V. K.; Groten, J. P., 2002. Statistically designed experiments in a tiered approach to screen mixtures of fusarium mycotoxins for possible interactions, Food and Chemical Toxicology, 40, 685-695.


Relevant references not retrieved in the literature searches for Area 5 IN VITRO TOXICITY:


AREA 6 OBSERVATIONS IN HUMANS

Reference list with all relevant references identified for AREA 6: Data on observations in humans (e.g. epidemiological studies, case reports, intervention studies) published in English since year 2000.

Relevant references retrieved in the literature searches for AREA 6 OBSERVATIONS IN HUMANS:


Shirima, ; Tu, Y. K., 2015. A prospective study of growth and biomarkers of exposure to aflatoxin and fumonisin during early childhood in tanzania (vol 123, pg 173, 2015), Environmental Health Perspectives, 123, A32-A32.


Extensive literature search for fumonisins and their modified forms


Relevant references not retrieved in the literature searches for Area 6 OBSERVATIONS IN HUMANS:


AREA 7 TOXICITY IN FARM ANIMALS

Reference list with all relevant references identified for AREA 7: Data on adverse effects in farm and companion animals (studies in the different species e.g. ruminants, pigs, poultry, rabbits, fish, cats, dogs etc.) published since year 1980.


Cavret, S.; Leceour, S., 2006. Fusariotoxins transfer in animal, Food and Chemical Toxicology, 44, 444-453.


Extensive literature search for fumonisins and their modified forms


Cortinovis, C.; Pizzo, F.; Spicer, L. J.; Caloni, F., 2013. Fusarium mycotoxins: Effects on reproductive function in domestic animals--a review, Theriogenology, 80, 557-564.

De Liguoro, M.; Petterino, C.; Mezzalira, G.; Tenti, S.; Ravarotto, L., 2004. Field observations in pigs exposed to fumonisin b1 contaminated feed, Veterinary and Human Toxicology, 46, 303-305.


Devreese, M.; De Backer, P.; Croubels, S., 2013. Overview of the most important mycotoxins for the pig and poultry husbandry, Vlaams Diergeneeskundig Tijdschrift, 82, 171-180.


Dombrink-Kurtzman, M. A.; Javed, T.; Bennett, G. A.; Richard, J. L.; Cote, L. M.; Buck, W. B., 1993. Lymphocyte cytotoxicity and erythrocytic abnormalities induced in broiler chicks by fumonisins b1 and b2 and moniliformin from fusarium proliferatum, Mycopathologia, 124, 47-54.


Ewuola, E. O., 2009. Organ traits and histopathology of rabbits fed varied levels of dietary fumonisin b(1), J Anim Physiol Anim Nutr (Berl), 93, 726-731.


Extensive literature search for fumonisins and their modified forms


Extensive literature search for fumonisins and their modified forms


Halloy, D. J.; Gustin, P. G.; Bouhet, S.; Oswald, I. P., 2005. Oral exposure to culture material extract containing fumonisins predisposes swine to the development of pneumonia caused by pasteurella multocida, Toxicology, 213, 34-44.


Javed, T.; Bunte, R. M.; Dombrink-Kurtzman, M. A.; Richard, J. L.; Bennett, G. A.; Cote, L. M.; Buck, W. B., 2005. Comparative pathologic changes in broiler chicks on feed amended with fusarium proliferatum culture material or purified fumonisin b1 and moniliformin, Mycopathologia, 159, 553-564.
Extensive literature search for fumonisins and their modified forms


Lalles, J. P.; Lessard, M.; Oswald, I. P.; David, J. C., 2010. Consumption of fumonisin b1 for 9 days induces stress proteins along the gastrointestinal tract of pigs, Toxicon, 55, 244-249.

Ledoux, D. R.; Bermudez, A. J.; Rottinghaus, G. E., 1996. Effects of feeding fusarium moniliforme culture material, containing known levels of fumonisin b1, in the young turkey poult, Poult Sci, 75, 1472-1478.


www.efsa.europa.eu/publications

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.


Meredith, F. I.; Riley, R. T.; Bacon, C. W.; Showker, J. L.; Williams, D.; Carlson, D., 1997. Dietary levels of fumonisin fb1 in feed correlated with sphingoid base elevation in rainbow trout liver and kidney tissue, Abstracts of Papers of the American Chemical Society, 213, 80-AGFD.

Meredith, F. I.; Riley, R. T.; Bacon, C. W.; Williams, D. E.; Carlson, D. B., 1998. Extraction, quantification, and biological availability of fumonisin b1 incorporated into the oregon test diet and fed to rainbow trout, J Food Prot, 61, 1034-1038.


Morgavi, D. P.; Riley, R. T., 2007. An historical overview of field disease outbreaks known or suspected to be caused by consumption of feeds contaminated with fusarium toxins, Animal Feed Science and Technology, 137, 201-212.


Extensive literature search for fumonisins and their modified forms


Posa, R.; Stoev, S.; Kovacs, M.; Donko, T.; Repa, I.; Magyar, T., 2016. A comparative pathological finding in pigs exposed to fumonisin b1 and/or mycoplasma hyopneumoniae, Toxicol Ind Health, 32, 998-1012.
Extensive literature search for fumonisins and their modified forms


Raynal, M.; Bailly, J. D.; Benard, G.; Guerre, P., 2001. Effects of fumonisin b1 present in fusarium moniliforme culture material on drug metabolising enzyme activities in ducks, Toxicology Letters, 121, 179-190.


Riley, R. T.; An, N. H.; Showker, J. L.; Yoo, H. S.; Norred, W. P.; Chamberlain, W. J.; Wang, E.; Merrill, A. H., Jr.; Motelin, G.; Beasley, V. R.; et al., 1993. Alteration of tissue and serum...
sphinganine to sphingosine ratio: An early biomarker of exposure to fumonisin-containing feeds in pigs, Toxicol Appl Pharmacol, 118, 105-112.


Ross, P. F., 1995. Effects of fumonisins in domestic livestock, Abstracts of Papers of the American Chemical Society, 209, 60-AGFD.


Weibking, T. S.; Ledoux, D. R.; Bermudez, A. J.; Rottinghaus, G. E., 1994. Individual and combined effects of feeding fusarium moniliforme culture material, containing known levels of fumonisin b1, and aflatoxin b1 in the young turkey poult, Poult Sci, 73, 1517-1525.


Extensive literature search for fumonisins and their modified forms


AREA 8 OCCURRENCE IN FOOD

Reference list with all relevant references identified for AREA 8: Data on occurrence in food published in English since year 2000.

Relevant references retrieved in the literature searches for Area 8 OCCURRENCE IN FOOD:


Altiparmak, G.; Tunali, B., 2009. Incidence of fusarium species and levels of fumonisin b-1 in corn in the samsun province of turkey, Phytoprotection, 90, 97-106.


Ashiq, S., 2015. Natural occurrence of mycotoxins in food and feed: Pakistan perspective, Comprehensive Reviews in Food Science and Food Safety, 14, 159-175.


Atukwase, A.; Kaaya, A. N.; Muyanja, C., 2012. Dynamics of fusarium and fumonisins in maize during storage - a case of the traditional storage structures commonly used in uganda, Food Control, 26, 200-205.


Extensive literature search for fumonisins and their modified forms


Bian, Y. N.; Huang, X. Y.; Ren, J. C., 2016. Sensitive and homogenous immunoassay of fumonisin in foods using single molecule fluorescence correlation spectroscopy, Analytical Methods, 8, 1333-1338.


Camargos, S. M.; Soares, L. M. V.; Sawazaki, E.; Bolonhezi, D.; Castro, J. L.; Bortolotto, N., 2002. Accumulation of fumonisins b(1) and b(2) in freshly harvested brazilian commercial maize at three locations during two nonconsecutive seasons, Mycopathologia, 155, 219-228.


Extensive literature search for fumonisins and their modified forms


Demir, C.; Simsek, O.; Arici, M., 2010. Incidence of fusarium verticillioides and levels of fumonisin b-1 and b-2 in corn in turkey, Food Science and Biotechnology, 19, 1103-1106.


Ezekiel, C. N.; Abia, W. A.; Ogara, I. M.; Sulyok, M.; Warth, B.; Kriska, R., 2015. Fate of mycotoxins in two popular traditional cereal-based beverages (kunu-zaki and pito) from rural nigeria, Lwt-Food Science and Technology, 60, 137-141.


Fernandes, P. J.; Barros, N.; Santo, J. L.; Camara, J. S., 2015. High-throughput analytical strategy based on modified quechers extraction and dispersive solid-phase extraction clean-up followed by liquid chromatography-triple-quadrupole tandem mass spectrometry for quantification of multiclass mycotoxins in cereals, Food Analytical Methods, 8, 841-856.


Extensive literature search for fumonisins and their modified forms


Isaacson, C., 2005. The change of the staple diet of black south africans from sorghum to maize (corn) is the cause of the epidemic of squamous carcinoma of the oesophagus, Med Hypotheses, 64, 658-660.

Extensive literature search for fumonisins and their modified forms


Extensive literature search for fumonisins and their modified forms


Kumar, V.; Basu, M. S.; Rajendran, T. P., 2008. Mycotoxin research and mycoflora in some commercially important agricultural commodities, Crop Protection, 27, 891-905.


Lawrence, J. F.; Menard, C.; Yeung, J.; Ben Rejeb, S., 2000. Determination of fumonisin contamination in maize by surface-enhanced raman spectroscopy (sers), Food and Bioprocess Technology, 9, 588-603.


Li, R. J.; Tao, B.; Pang, M. H.; Liu, Y. C.; Dong, J. G., 2015. Natural occurrence of fumonisins b-1 and b-2 in maize from three main maize-producing provinces in china, Food Control, 50, 838-842.


Lino, C. M.; Silva, L. J. G.; Pena, A. L. S.; Silveira, M. I., 2006. Determination of fumonisins b1 and b2 in portuguese maize and maize-based samples by hplc with fluorescence detection, Analytical and Bioanalytical Chemistry, 384, 1214-1220.

Extensive literature search for fumonisins and their modified forms


Extensive literature search for fumonisins and their modified forms


Extensive literature search for fumonisins and their modified forms


Molinie, A.; Faucet, V.; Castegnaro, P.; Pfohl-Leszkowicz, A., 2005. Analysis of some breakfast cereals on the french market for their contents of ochratoxin a, citrinin and fumonisin b-1: Development of a method for simultaneous extraction of ochratoxin a and citrinin, Food Chemistry, 92, 391-400.


Extensive literature search for fumonisins and their modified forms


Extensive literature search for fumonisins and their modified forms


Oh, K. S.; Scott, P. M.; Chung, S. H., 2009. Incomplete recoveries of fumonisins present in naturally contaminated corn foods from an immunoaffinity column, J AOAC Int, 92, 496-501.


Ouf, S. A.; Mohamed, A. A. H.; El-Sayed, W. S., 2016. Fungal decontamination of fleshy fruit water washes by double atmospheric pressure cold plasma, Clean-Soil Air Water, 44.


Park, J. W.; Scott, P. M.; Lau, B. P. Y., 2013. Analysis of n-fatty acyl fumonisins in alkali-processed corn foods, Food Science and Biotechnology, 22, 147-152.


Petersen, A.; Thorup, I., 2001. Preliminary evaluation of fumonisins by the nordic countries and occurrence of fumonisins (fb1 and fb2) in corn-based foods on the danish market, Food Addit Contam, 18, 221-226.


Pietri, A.; Bertuzzi, T., 2012. Simple phosphate buffer extraction for the determination of fumonisins in masa, maize, and derived products, Food Analytical Methods, 5, 1088-1096.


Pitt, J. I.; Taniwaki, M. H.; Cole, M. B., 2013. Mycotoxin production in major crops as influenced by growing, harvesting, storage and processing, with emphasis on the achievement of food safety objectives, Food Control, 32, 205-215.


Scaff, R. M. C.; Scussell, V. M., 2004. Fumonisins b(1) and b(2) in corn-based products commercialized in the state of santa catarina - southern brazil, Brazilian Archives of Biology and Technology, 47, 911-919.


Extensive literature search for fumonisins and their modified forms

Additives and Contaminants Part a-Chemistry Analysis Control Exposure & Risk Assessment, 32, 440-452.


Extensive literature search for fumonisins and their modified forms


www.efsa.europa.eu/publications

The present document has been produced and adopted by the bodies identified above as authors. This task has been carried out exclusively by the authors in the context of a contract between the European Food Safety Authority and the authors, awarded following a tender procedure. The present document is published complying with the transparency principle to which the Authority is subject. It may not be considered as an output adopted by the Authority. The European Food Safety Authority reserves its rights, view and position as regards the issues addressed and the conclusions reached in the present document, without prejudice to the rights of the authors.


Szabo-Fodor, J.; Bors, I.; Szabo, A.; Kovacs, M., 2016. Comparison of the amount of bioaccessible fumonisin b1 and b2 in maize and rice inoculated with fusarium verticillioides (mrc 826) and determined by in vitro digestion-preliminary results, Mycotoxin Res, 32, 173-178.


Torres, A. M.; Reynoso, M. M.; Rojo, F. G.; Ramirez, M. L.; Chulze, S. N., 2001. Fusarium species (section liseola) and its mycotoxins in maize harvested in northern argentina, Food Addit Contam, 18, 836-843.


Extensive literature search for fumonisins and their modified forms

Fumonisin intake in women from high-and low-exposure communities in guatemala, Molecular Nutrition & Food Research, 58, 973-983.


Trung, T. S.; Tabuc, C.; Bailly, S.; Querin, A.; Guerre, P.; Bailly, J. D., 2008. Fungal mycoflora and contamination of maize from vietnam with aflatoxin b(1) and fumonisin b(1), World Mycotoxin Journal, 1, 87-94.


van der Westhuizen, L.; Shephard, G. S.; Rheeder, J. P.; Somdyala, N. I. M.; Marasas, W. F. O., 2008. Sphingoid base levels in humans consuming fumonisin-contaminated maize in rural areas of the


Vanara, F.; Reyneri, A.; Blandino, M., 2009. Fate of fumonisin b-1 in the processing of whole maize kernels during dry-milling, Food Control, 20, 235-238.


Wei, T.; Zhu, W.; Pang, M.; Liu, Y.; Dong, J., 2013. Natural occurrence of fumonisins b1 and b2 in corn in four provinces of china, Food Addit Contam Part B Surveill, 6, 270-274.


Extensive literature search for fumonisins and their modified forms


Relevant references not retrieved in the literature searches for Area 8 OCCURRENCE IN FOOD:

Belajova, E.; Rauova, D.; Dasko, L., 2007. Retention of ochratoxin a and fumonisin b1 and b2 from beer on solid surfaces: Comparison of efficiency of adsorbents with different origin, European Food Research and Technology, 224, 301-308.


AREA 9 OCCURRENCE IN FEED

Reference list with all relevant references identified for AREA 9: Data on occurrence in feed and animal exposure (including feed occurrence in the different feed commodities, feed intake and animal exposure) published in English since year 2000.

Relevant references retrieved in the literature searches for Area 9 OCCURRENCE IN FEED:


Ashiq, S., 2015. Natural occurrence of mycotoxins in food and feed: Pakistan perspective, Comprehensive Reviews in Food Science and Food Safety, 14, 159-175.

Atukwase, A.; Kaaya, A. N.; Muyanja, C., 2012. Dynamics of fusarium and fumonisins in maize during storage - a case of the traditional storage structures commonly used in uganda, Food Control, 26, 200-205.


Camargos, S. M.; Soares, L. M. V.; Sawazaki, E.; Bolonhezi, D.; Castro, J. L.; Bortolletto, N., 2002. Accumulation of fumonisins b(1) and b(2) in freshly harvested brazilian commercial maize at three locations during two nonconsecutive seasons, Mycopathologia, 155, 219-228.


Extensive literature search for fumonisins and their modified forms


Das, I. K.; Kumar, B. S. V.; Ratnavathi, C. V.; Komala, V. V.; Annapurna, A.; Seetharama, N., 2010. Toxicity of fusarium isolates and fumonisin b-1 contamination in rainy season sorghum (sorghum bicolor), Indian Journal of Agricultural Sciences, 80, 724-729.


Devreese, M.; De Backer, P.; Croubels, S., 2013. Overview of the most important mycotoxins for the pig and poultry husbandry, Vlaams Diergeneeskundig Tijdschrift, 82, 171-180.


Extensive literature search for fumonisins and their modified forms


Extensive literature search for fumonisins and their modified forms


Morgavi, D. P.; Riley, R. T., 2007. An historical overview of field disease outbreaks known or suspected to be caused by consumption of feeds contaminated with fusarium toxins, Animal Feed Science and Technology, 137, 201-212.


through monitoring 1991 to 1997 corn crop in the state of parana, brazil, Mycopathologia, 158, 451-455.


Oruc, H. H.; Cengiz, M.; Kalkanli, O., 2006. Comparison of aflatoxin and fumonisin levels in maize grown in turkey and imported from the USA, Animal Feed Science and Technology, 128, 337-341.


Extensive literature search for fumonisins and their modified forms


Rodriguez-Cervantes, C. H.; Ramos, A. J.; Robledo-Marenco, M. L.; Sanchis, V.; Marin, S.; Giron-Perez, M. I., 2013. Determination of aflatoxin and fumonisin levels through elisa and hplc, on tilapia feed in nayarit, mexico, Food and Agricultural Immunology, 24, 269-278.


Extensive literature search for fumonisins and their modified forms


Teller, R. S.; Schmidt, R. J.; Whitlow, L. W.; Kung, L., Jr., 2012. Effect of physical damage to ears of corn before harvest and treatment with various additives on the concentration of mycotoxins, silage fermentation, and aerobic stability of corn silage, J Dairy Sci, 95, 1428-1436.

Torres, A. M.; Reynoso, M. M.; Rojo, F. G.; Ramirez, M. L.; Chulze, S. N., 2001. Fusarium species (section liseola) and its mycotoxins in maize harvested in northern argentina, Food Addit Contam, 18, 836-843.
Extensive literature search for fumonisins and their modified forms


Relevant references not retrieved in the literature searches for Area 9 OCCURRENCE IN FEED:
