Literature Review Report

Scientific peer-reviewed open literature covering the publication period of July 2020 to December 2020 for the approval of pesticide active substance glyphosate and metabolites

as under Article 8(5) of Regulation (EC) No 1107/2009

(Ref. EFSA Journal 2011; 9(2) 2092)

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Author
Anonymous, 2022

Sponsor
[redacted]

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1 Summary

A literature search for glyphosate and its metabolites[1] was conducted according to the requirements stated in the EFSA 2092 Guidance Document (GD) - EFSA Journal 2011;9(2):2092 "*Submission of scientific peer-reviewed open literature for the approval of pesticide active substances under Regulation (EC) 1107/2009*[2]", and the Appendix to the EFSA 2092 Guidance Document "*Further guidance on performing and presenting the literature search*"[3], and the EFSA supporting publication from 2019[4] "*Administrative guidance on submission of dossiers and assessment reports for the peer-review of pesticide active substances".*

In addition, a recommendation by the Assessment Group on Glyphosate (AGG)[5] on how to present the literature search in the dossier has been followed. Please refer to **Appendix 1** (page 82) for more details.

This Literature Review Report summarizes the search and evaluation of the glyphosate scientific peer-reviewed open literature covering the publication period of July 2020 to December 2020 and is supplementary to the previous searches covering the publication period of January 2010 to June 2020.[6]

The literature search was conducted accessing 11 bibliographic databases via the service provider STN.

In total, 880 articles were identified upon removal of duplicates within the current search (July 2020 – December 2020) and articles found already in the previous searches (January 2010 – June 2020).
All 880 articles were subsequently assessed for their relevance at title/abstract level ("rapid assessment" according to the procedure and requirements stated in the EFSA 2092 GD).

A total of 786 of the 880 articles were identified as "non-relevant" in the rapid assessment (e.g. publications dealing with chemical synthesis, efficacy, analytical methods or publications which are not related to glyphosate or its metabolites) and excluded from further evaluation. Due to the large quantity of data, and as agreed with the AGG, the list of articles and the justification for their non-relevance is provided in a standalone Literature Review Excel File (Document ID: 113898_CA9-2_Literature Review Excel File).

For the remaining 94 articles, identified as potentially "relevant" or of "unclear relevance" in the rapid assessment, the full-text documents[7] were reviewed in detail ("detailed assessment").

A total of 30 articles of the remaining 94 articles were identified as "non-relevant" in the detailed assessment and were excluded from further evaluation. The list of the articles and the justification for their non-relevance is provided in **Table 38** of this Literature Review Report document.

The remaining 64 articles of the 94 articles were identified as "relevant" in the detailed assessment and

[1] (aminomethyl)phosphonic acid (AMPA), N-acetyl-AMPA, N-acetyl-glyphosate, (hydroxymethyl)phosphonic acid (HMPA), N-methyl-AMPA, N-glyceryl-AMPA, N-malonyl-AMPA, methylphosphonic acid and N-methylglyphosate.
[2] European Food Safety Authority, 2011: *Submission of scientific peer-reviewed open literature for the approval of pesticide active substances under Regulation (EC) No 1107/2009.* EFSA Journal 2011;9(2):2092. 49 pp, doi:10.2903/j.efsa.2011.2092.
[3] Appendix to EFSA Journal 2011;9(2):2092. *Further guidance on performing and presenting the literature search.* Available online: https://efsa.onlinelibrary.wiley.com/action/downloadSupplement?doi=10.2903/j.efsa.2011.2092&file=efs22092-sup-0001-Appendix.pdf
[4] European Food Safety Authority, 2019. *Administrative guidance on submission of dossiers and assessment reports for the peer-review of pesticide active substances.* EFSA supporting publication 2019:EN-1612. 49 pp., doi:10.2903/sp.efsa.2019.EN-1612.
[5] On 10th May 2019, the European Commission appointed four Member States (France, Hungary, the Netherlands and Sweden) to act jointly as 'rapporteurs' for the AIR5 process assessment of glyphosate. This group of Member States is known as the Assessment Group on Glyphosate (AGG).
[6] See Literature Review Reports 108689-CA9-1 and 113898-CA9-1 for more details.
[7] All articles used within the glyphosate dossier have been purchased via Copyright Clearance Centre. In some cases, please note that the Copyright Clearance is not overtly visible, and in some instances is part of the article documents. Should the Copyright Clearance proof be required, this can be provided upon request.

were classified according to the EFSA 2092 GD (EFSA Journal 2011;9(2):2092, Point 5.4.1).

Category A Articles which provide data for establishing or refining risk assessment parameters.
For all articles of Category A, a reliability assessment was performed as recommended in the EFSA 2092 GD. In addition, summaries were compiled for Category A articles classified as "reliable" or "reliable with restrictions". The list of these Category A & reliable / reliable with restrictions articles can be found in **Table 32** and **Table 33** of this Literature Review Report document.

Category B Articles relevant to the data requirement but in the opinion of the applicant providing only supplementary information that does not alter existing risk assessment.
A justification for such decision is provided as recommended in the EFSA 2092 GD. The list of these Category B articles and the justifications can be found in **Table 34** and **Table 35** of this Literature Review Report document.

Category C Articles for which relevance cannot be clearly determined.
As recommended in the EFSA 2092 GD, an explanation is provided why the relevance could not be determined. The list of these Category C articles and the explanations can be found in **Table 36** and **Table 37** of this Literature Review Report document.

The full outcome of the literature evaluation is provided in **Table 1**.

Table 1: Summary of the literature review

Section	Number of articles found	Rapid assessment (title/abstract level)		Detailed assessment (full-text level)	
		non-relevant articles	potentially relevant / unclear relevance	non-relevant articles	relevant articles (Category A+B+C)
Efficacy / Agronomy [a)]	372	372	n.a.	n.a.	n.a.
Analytical methods [a)]	67	67	n.a.	n.a.	n.a.
Other non-relevant categories [b)]	74	74	n.a.	n.a.	n.a.
Ecotoxicology	133	107	26	10	16
E-fate	91	84	7	4	3
Residues	26	15	11	2	9
Toxicology	117	67	50	14	36
Total	**880**	**786**	**94**	**30**	**64**

[a)] Efficacy / Agronomy (e.g. reporting desired effects on organisms to be controlled) and development of analytical methods (artificial measurements) do not provide information useful/required for the environmental or human safety risk assessment.
[b)] The category "other non-relevant categories" covers a wide range of scientific publications which are not related to glyphosate or its metabolites or are not related to exposure of humans or the environment to glyphosate or its metabolites and thus not relevant for the risk assessments.

The full outcome of the relevant articles after detailed (full-text) assessment is provided in **Table 2**.

Table 2: Relevant articles by full-text classified according to the EFSA 2092 GD, Point 5.4.1

	Relevant articles by full-text (EFSA 2092 GD, Point 5.4.1)		
Section	**Category A** [a)]	**Category B** [b)]	**Category C** [c)]
Ecotoxicology	3	12	1
E-fate	3	0	0
Residues	0	9	0
Toxicology	3	32	1
Total	**9**	**53**	**2**

[a)] Category A: Articles, which provide data for establishing or refining risk assessment parameters.
[b)] Category B: Articles relevant to the data requirement but in the opinion of the applicant providing only supplementary information that does not alter existing risk assessment.
[c)] Category C: Articles for which relevance cannot be clearly determined.

All articles (and their translations) evaluated at full text level (detailed assessment) were submitted to the AGG in a Portable Document Format (PDF).

Please refer to **Appendix 2** (page 83) to see the article selection process in detail.

2 Introduction

A literature search for glyphosate and its metabolites[1] was conducted according to the requirements stated in the EFSA 2092 Guidance Document - EFSA Journal 2011;9(2):2092 "*Submission of scientific peer-reviewed open literature for the approval of pesticide active substances under Regulation (EC) 1107/2009*[2]", and the Appendix to the EFSA 2092 Guidance Document "*Further guidance on performing and presenting the literature search*"[3], and the EFSA Supporting publication from 2019[4] "*Administrative guidance on submission of dossiers and assessment reports for the peer-review of pesticide active substances".*

In addition, a recommendation by the Assessment Group on Glyphosate (AGG) on how to present the literature search in the dossier has been followed. Please refer to **Appendix 1** (page 82) for more details.

In June 2020, a Literature Review Report (Document ID: 108689-CA9-1) summarizing results of the search of the glyphosate scientific peer-reviewed open literature published from January 2010 to December 2019 was submitted to the AGG as part of the glyphosate AIR5 dossier. In July 2020 during the dossier completeness check (point 23)[8], the AGG requested a top-up search for glyphosate open literature covering the publication period of January 2020 to June 2020. In October 2020, a Literature Review Report (Document ID: 113898-CA9-1) summarizing results of this top-up search was submitted to the AGG.

Furthermore, an additional top-up literature search of the glyphosate scientific peer-reviewed open literature was performed in January 2021 and the results of the search are summarized in this Literature Review Report (Document ID: 113898-CA9-2). The current search covers the publication period of July 2020 to December 2020. Details for this search are provided below.

The search has been conducted via the online service provider STN (www.stn-international.de) that provides access to a broad range of databases and to published research, journal literature, patents, structures, sequences, properties, and other data.

To offer a comprehensive literature search covering the requirements of the EFSA 2092 GD eleven databases have been used: AGRICOLA, BIOSIS, CABA, CAPLUS, EMBASE, ESBIOBASE, MEDLINE, TOXCENTER, FSTA, PQSCITECH, and SCISEARCH.

Please refer to **Table 3** for more details on the literature search.

[8] AGG's letter dated 10-July-2020, subject "Glyphosate: Check of completeness of the supplementary dossier for renewal of approval under Commission Implementing Regulation (EU) No 844/2012", section 2: Elements to be submitted in accordance with Article 11(5) of Regulation (EU) No 844/2012, point 23.

Table 3: Overview of the search conducted for glyphosate and its metabolites

Performed for	Covering publication period	Conducted on
Glyphosate AMPA N-acetyl-AMPA N-acetyl-glyphosate HMPA N-methyl-AMPA N-glyceryl-AMPA N-malonyl-AMPA methylphosphonic acid N-methylglyphosate	July 2020 – December 2020	5 January 2021

AMPA = (aminomethyl)phosphonic acid
HMPA = (hydroxymethyl)phosphonic acid

A "focused search for grouped data requirements"[9] have been performed (a combination of a substance basic input parameters, keywords and "search filters" defined for the four technical sections – toxicology, residues, environmental fate, and ecotoxicology).

Please refer to **Chapter 2.2** and **2.3** (pages 14 and 16) for the input parameters, keywords and search filters used in the literature search.

Regarding details on the bibliographic databases used in the literature search, please refer to **Chapter 2.1** (**Table 4**).

Regarding the number of articles retrieved in the literature search, please refer to **Chapter 2.1** (**Table 5**).

For the relevance and reliability assessment, please refer to **Chapter 2.4** and **2.5** (pages 19 and 22).

For the full outcome of the literature search and for the individual technical sections, please refer to **Chapter 3** (page 27).

[9] Citation from the EFSA 2092 Guidance Document: *If the number of summary records returned by a single concept search* is extremely large, focused searches for individual or grouped data requirements could be developed. Such searches could combine synonyms for the active substance (one concept) with terms and synonyms for characteristics of the data requirement (second concept).*

**NOTE:* Single concept search (as defined in the EFSA 2092 GD document) = using the active substance names and its synonyms.

2.1 Bibliographic databases used in the literature search

Table 4: Overview of the databases used in the literature search

Data requirement(s) captured in the search	Details of the search(es)			
	1. AGRICOLA	**2. BIOSIS**	**3. CABA**	**4. CAPLUS**
Justification for choosing the source:	Provides literature from agriculture and related fields, e.g. biology, biotechnology, botany, ecology etc.	Provides the most comprehensive and largest life science literature, e.g. biosciences, biomedicine etc.	Provides literature from agriculture and related sciences, e.g. biotechnology, forestry, veterinary medicine etc.	Provides literature from chemistry and related fields, e.g. biochemistry, chemical engineering etc.
Number of records in the database at the time of search:	> 7.1 million (09/2020)	> 27.8 million (04/2019)	> 9.9 million (09/2020)	> 57.0 million (01/2022)
Database update:	Monthly	Weekly	Weekly	Daily updates bibliographic data; weekly updates indexing data
Date of the search:	05 January 2021	05 January 2021	05 January 2021	05 January 2021
Database covers records:	1970-present	1926-present	1973-present	1907-present and more than 180,000 pre-1907
Date of the latest database update:	7 December 2020	30 December 2020	05 January 2021	04 January 2021
Language limit:	No	No	No	No
Document types <u>excluded</u> that are not "scientific peer-reviewed open literature":	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release
Search strategy:	Details are summarized in **Chapter 2.2** and **2.3**.			
Total number of records retrieved:	125	291	470	504

Table 4: Overview of the databases used in the literature search (continued)

Data requirement(s) captured in the search	Details of the search(es)		
	5. MEDLINE	**6. EMBASE**	**7. TOXCENTER**
Justification for choosing the source:	Provides literature from every area of medicine.	Provides literature from biomedicinal and pharmaceutical fields, e.g. bioscience, biochemistry, human medicine, forensic science, paediatrics, pharmacy, pharmacology, drug therapy, psychiatry, public health, biomedical engineering, environmental science.	Provides literature on pharmacological, biochemical, physiological, and toxicological effects of drugs and other chemicals.
Number of records in the database at the time of search:	> 33.5 million (01/2022)	> 34.3 million (08/2018)	> 16.2 million (01/2022)
Database update:	Six times each week, with an annual reload	Daily	Weekly
Date of the search:	05 January 2021	05 January 2021	05 January 2021
Database covers records:	1946-present	1974-present	1907-present
Date of the latest database update:	04 January 2021	04 January 2021	04 January 2021
Language limit:	No	No	No
Document types <u>excluded</u> that are not "scientific peer-reviewed open literature":	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release
Search strategy:	Details are summarized in **Chapter 2.2** and **2.3**.		
Total number of records retrieved:	237	204	593

Table 4: Overview of the databases used in the literature search (continued)

Data requirement(s) captured in the search	Details of the search(es)			
	8. FSTA	**9. PQSCITECH**	**10. ESBIOBASE**	**11. SCISEARCH**
Justification for choosing the source:	Provides literature on scientific and technological aspects of the processing and manufacture of human food products, e.g. biotechnology, hygiene and toxicology, engineering etc.	Provides a valuable and huge resource of literature (merge of 25 STN databases) from all science areas and technology; from engineering to lifescience.	Provides comprehensive literature on entire spectrum of biological and biosciences research, e.g. microbiology, biotechnology, ecological & environmental sciences, genetics, plant and crop science, toxicology and many more.	Provides one of the largest multidisciplinary scientific literature covering a broad field of sciences, technology, and biomedicine.
Number of records in the database at the time of search:	> 1.59 million (09/2020)	> 33.6 million (01/2021)	> 9.0 million (01/2021)	> 47.7 million (08/2019)
Database update:	Weekly	Monthly	Weekly	Weekly
Date of the search:	05 January 2021	05 January 2021	05 January 2021	05 January 2021
Database covers records:	1969-present	1962-present	1994-present	1974-present
Date of the latest database update:	29 December 2020	16 December 2020	30 December 2020	04 January 2021
Language limit:	No	No	No	No
Document types excluded that are not "scientific peer-reviewed open literature":	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release	Comments, dissertations, editorials, meetings reports, news, patents, press release
Search strategy:	Details are summarized in **Chapter 2.2** and **2.3**.			
Total number of records retrieved:	37	95	200	541

Table 5: Total number of articles retrieved

Scope of the search	After automatic removal of duplicates within the databases in the current search (Jul 2020 – Dec 2020)	After applying search filters [a] within the current search (Jul 2020 – Dec 2020)	After manual removal of duplicates [b] within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020) [c]
July 2020 – December 2020 Glyphosate AMPA N-acetyl-AMPA N-acetyl-glyphosate HMPA N-methyl-AMPA N-glyceryl-AMPA N-malonyl-AMPA methylphosphonic acid N-methylglyphosate	**1797**	**1781**	**880**

[a] Search filters applied for the four technical sections (residues, environmental fate, toxicology and ecotoxicology). Please refer to **Chapter 2.3** for more details (page 16).

[b] Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[c] Please refer to the Literature Review Report (LRR) 108689-CA9-1 and 113898-CA9-1.

Note: LRR 108689-CA9-1 covers the publication period of 1 January 2010 to 31 December 2019, LRR 113898-CA9-1 covers the publication period of 1 January 2020 to 30 June 2020.

2.2 Input parameters used in the literature search

The basic input parameters used in the literature search, e.g. IUPAC, chemical name or CAS number, are provided in **Table 6 - Table 15**.

Table 6: Input parameters – active substance Glyphosate

Substance name	Glyphosate Salts: isopropylamine, potassium, ammonium, methylmethanamine
IUPAC / CA name	2-(phosphonomethylamino)acetic acid
CAS number(s)	1071-83-6 Salts: 38641-94-0, 70901-12-1, 39600-42-5, 69200-57-3, 34494-04-7, 114370-14-8, 40465-66-5, 69254-40-6

Table 7: Input parameters – metabolite AMPA

Substance name	AMPA
IUPAC / CA name	(aminomethyl)phosphonic acid
CAS number(s)	1066-51-9

Table 8: Input parameters – metabolite N-acetyl glyphosate

Substance name	N-acetyl glyphosate
IUPAC / CA name	N-acetyl-N-(phosphonomethyl)glycine
CAS number(s)	129660-96-4

Table 9: Input parameters – metabolite N-acetyl AMPA

Substance name	N-acetyl AMPA
IUPAC / CA name	[(acetylamino)methyl]phosphonic acid
CAS number(s)	57637-97-5

Table 10: Input parameters – metabolite HMPA

Substance name	HMPA
IUPAC / CA name	(hydroxymethyl)phosphonic acid
CAS number(s)	2617-47-2

Table 11: Input parameters – metabolite N-methyl AMPA

Substance name	N-methyl AMPA
IUPAC / CA name	[(methylamino)methyl]phosphonic acid
CAS number(s)	35404-71-8

Table 12: Input parameters – metabolite N-glyceryl AMPA

Substance name	N-glyceryl AMPA
IUPAC / CA name	(2,3-dihydroxypropanoylamino)methylphosphonic acid
CAS number(s)	No data

Table 13: Input parameters – metabolite N-malonyl AMPA

Substance name	N-malonyl AMPA
IUPAC / CA name	3-oxo-3-(phosphonomethylamino)propanoic acid
CAS number(s)	no data

Table 14: Input parameters – metabolite methylphosphonic acid

Substance name	methylphosphonic acid
IUPAC / CA name	methylphosphonic acid
CAS number(s)	993-13-5

Table 15: Input parameters – metabolite N-methylglyphosate

Substance name	N-methylglyphosate
IUPAC / CA name	2-[methyl(phosphonomethyl)amino]acetic acid
CAS number(s)	24569-83-3

2.3 Keywords and search filters used in the literature search

The approach used for the search was the "focused search for grouped data requirements"[10], which combines the active substance and metabolite basic input parameters, keywords and search filters defined for each technical section. Please refer to **Table 16** for more details on the keywords used and to **Table 17** - **Table 20** for the search filters.

Table 16: Keywords used for the active substance glyphosate and its metabolites

Gly1: Glyphosate and AMPA	glyphosat? OR glifosat? OR glyfosat? OR 1071-83-6 OR 38641-94-0 OR 70901-12-1 OR 39600-42-5 OR 69200-57-3 OR 34494-04-7 OR 114370-14-8 OR 40465-66-5 OR 69254-40-6 OR aminomethyl phosphonic OR aminomethylphosphonic OR 1066-51-9
Gly2: N-acetyl glyphosate and N-acetyl AMPA	2 acetyl phosphonomethyl amino acetic acid OR n acetyl glyphosate OR n acetylglyphosate OR n acetyl n phosphonomethyl glycine OR 129660-96-4 OR n acetyl ampa OR acetylamino methyl phosphonic acid OR acetylaminomethyl phosphonic acid OR 57637-97-5
Gly 3: HMPA	2617-47-2 OR hydroxymethanephosphonic acid OR hydroxymethyl phosphonate OR hydroxymethylphosphonate OR hydroxymethyl phosphonic acid OR hydroxymethylphosphonic acid OR methanehydroxyphosphonic acid OR phosphonic acid(1w)hydroxymethyl OR phosphonomethanol
Gly 4: N-methyl AMPA	35404-71-8 OR methylamino methyl phosphonic acid OR methylaminomethyl phosphonic acid OR methylaminomethylphosphonic acid OR n methyl ampa OR nsc 244826 OR phosphonic acid methylamino methyl OR phosphonic acid p methylamino methyl
Gly 4: N-glyceryl AMPA	2 3 dihydroxy 1 oxopropyl aminomethyl phosphonic acid OR 2 3 dihydroxy 1 oxopropyl aminomethylphosphonic acid OR n glyceryl ampa
Gly 4: N-malonyl AMPA	3 oxo 3 phosphonomethyl amino propanoic acid OR 3 oxo 3 phosphonomethyl aminopropanoic acid OR n malonyl ampa
Gly 4: methylphosphonic acid	993-13-5 OR dihydrogen methylphosphonate OR methanephosphonic acid OR methyl phosphonic acid OR methylphosphonic acid OR nsc 119358 OR phosphonic acid methyl OR phosphonic acid p methyl
Gly 5: N-methylglyphosate (NMG)	24569-83-3 OR 2 methyl phosphonomethyl amino acetic acid OR 2 methyl phosphonomethyl aminoacetic acid OR acetic acid 2 n methyl n phosphonatomethyl amino OR glycine n methyl n phosphonomethyl OR glyphosate n methyl OR methyl glyphosate OR methyl phosphonomethyl amino acetic acid OR methyl phosphonomethyl aminoacetic acid OR n methyl n phosphonomethyl glycine OR n methylglyphosate OR n phosphonomethyl n methyl glycine OR n phosphonomethyl n methylglycine

(1w) = proximity operator (this order, up to 1 word between)
AND / OR / NOT = boolean search operators
? = any character(s)

[10] Citation from the EFSA 2092 GD: *If the number of summary records returned by a single concept search* is extremely large, focused searches for individual or grouped data requirements could be developed. Such searches could combine synonyms for the active substance (one concept) with terms and synonyms for characteristics of the data requirement (second concept).*

**NOTE:* Single concept search (as defined in the EFSA 2092 GD document) = using the active substance names and its synonyms.

Table 17: Search filters related to the technical section toxicology

Toxicology [Gly1] OR [Gly2] OR [Gly3] OR [Gly4] OR [Gly5] AND the following search filters
tox? OR hazard? OR adverse OR health OR NOAEL OR NOEL OR LOAEL OR LOEL OR BMD? OR in vivo OR in vitro OR invivo OR invitro OR mode of action OR skin? OR eye? OR irrit? OR sensi? OR allerg? OR rat OR rats OR dog? OR rabbit? OR guinea pig? OR mouse OR mice OR metabolism OR metabolite? OR metabolic OR distribution OR adsorption OR excretion OR elimination OR kinetic OR cytochrome OR enzym? OR gen? OR muta? OR chromos? OR clastogen? OR DNA OR carcino? OR cancer? OR tumor? OR tumour? OR oncog? OR oncol? OR malign? OR immun? OR neur? OR endocrin? OR hormon? OR gonad? OR disrupt? OR reproduct? OR development? OR malform? OR anomal? OR fertil? OR foet? OR fet? OR matern? OR pregnan? OR embryo? OR epidem? OR medical? OR poison? OR exposure OR operator? OR bystander? OR resident? OR worker? OR occupat? biomonitoring OR human exposure OR microbiome OR oxidative stress OR apoptosis OR necrosis OR cytotoxicity OR Polyoxyethyleneamine OR POEA OR surfactant OR risk assessment?

Table 18: Search filters related to the technical section residues

Residues [Gly1] OR [Gly2] OR [Gly3] OR [Gly4] OR [Gly5] AND the following search filters
uptake OR translocation OR rumen OR storage stability OR storage OR stability OR metabolic OR metabolism OR breakdown OR nature of residues OR residue? OR magnitude of residues OR process? OR effects of processing OR dessicant OR preharvest OR preemerg? OR ?resistant? OR ?toleran? OR transgenic OR hydroly? OR rotation? OR succeed? OR plant? OR crop? OR feed? OR animal? OR livestock? OR hen OR cattle OR ruminant? OR goat? OR cow? OR pig? OR dietary OR assessment OR risk assessment OR consum? OR exposure

Table 19: Search filters related to the technical section environmental fate

Environmental fate [Gly1] OR [Gly2] OR [Gly3] OR [Gly4] OR [Gly5] AND the following search filters
soil OR water OR sediment OR degradat? OR photo? OR soil residues OR soil accumulat? OR soil contaminat? OR mobility OR sorption OR column leaching OR aged residue OR leach? OR lysimeter OR groundwater OR contaminat? OR microb? OR exudation OR rhizosphere OR dissipation OR saturated zone OR hydrolysis OR drift OR run-off OR runoff OR drainage OR volat? OR atmosphere OR long-range transport OR short-range transport OR transport OR micronutrient OR phosphate OR iron OR manganese OR half-life OR halflife OR half-lives OR halflives OR DT50 OR kinetics OR off-site movement OR removal OR drinking water OR water treatment processes OR atmospheric deposition OR tile-drains OR surface water OR monitoring data OR disinfectant OR ozone OR tillage OR infiltration OR hard surface OR rainwater OR rain water OR chelat? OR complex? OR mineralization OR persistence OR ligand

Table 20: Search filters related to the technical section ecotoxicology

Ecotoxicology [Gly1] OR [Gly2] OR [Gly3] OR [Gly4] OR [Gly5] AND the following search filters
tox? OR ecotox? OR ?toxic OR ?toxicity OR hazard OR adverse OR endocrine disrupt? OR bioaccumulate? OR biomagnifi? OR bioconcentration OR poison OR effect OR indirect effect? OR direct effect? OR biodivers? OR protection goals OR eco? OR impact OR population OR community OR wildlife OR incident OR wildlife OR incident OR pest OR bird? OR acute OR chronic OR long-term OR mallard OR duck OR quail OR bobwhite OR Anas? OR Colinus? OR wild OR dietary OR aquatic OR fish OR daphni? OR alg? OR chiron? OR sediment dwell? OR benthic OR lemna OR marin? OR estuarine OR crusta? OR gastropod? OR insect OR mollusc OR reptile OR amphib? OR plant AND submerge? OR emerge? OR bee? OR apis OR apidae OR bumble? OR colony OR hive OR pollinator OR solitary OR alg? OR aquatic OR freshwater OR vertebrat? OR mammal? OR rat OR mouse OR mice OR rabbit OR hare OR protection OR model? OR vole OR pest OR arthropod? OR beneficials OR typhlodromus OR aphidius OR parasitoid OR predator OR chrysoperla OR Orius OR spider OR worm? OR ?worm OR Eisenia OR soil OR collembol? OR macro organism OR folsomia OR springtail OR decompos? OR micro organisms OR microorganisms OR microbial OR carbon OR nitrogen OR plant? OR vegetative vigo? OR seedling OR germination OR monocot? OR dicot? OR sewage OR activated sludge OR biodegrad? OR bioaccumulation? OR amphib? OR reptile? OR aquatic plant OR beneficial

2.4 Relevance assessment

After removal of duplicates, the remaining articles were assessed for their relevance. First, at "title / abstract level" (so-called "rapid assessment") and second, at "full-text level" (so called "detailed assessment").
Articles that were identified as "non-relevant" in the rapid assessment were excluded from further evaluation and a justification for their non-relevance was provided.
For articles that were not excluded in the rapid assessment (potentially relevant articles and articles of an unclear relevance), a detailed relevance assessment of a full-text document was performed.
Articles that were identified as "non-relevant" in the detailed assessment were excluded from further evaluation and a justification for their non-relevance was provided.

For both assessments (rapid and detailed) the same criteria for non-relevance were applied (see **Chapter 2.4.1** and **2.4.2**).

2.4.1 Criteria applied for "non-relevance"

Articles identified as "non-relevant" in the rapid and detailed assessments belong to one of the following categories and were excluded from further evaluation. A justification for their non-relevance was provided.

- Publications related to efficacy (resistance related articles, new uses of control of pest / crops) or to agricultural / biological research (crop science, breeding, fertilization, tillage, fundamental plant physiology / micro- / molecular biology).
- Publications dealing with analytical methods / development.
- Publications describing new methods of synthesis (discovery / developments) or other aspects of basic (organic / inorganic) chemistry.
- Patents.
- Wastewater treatment.
- Abstracts referring to a conference contribution that does not contain sufficient data / information for regulatory risk assessment.
- Publications focusing on genetically modified organisms / transgenic crops; no data directly relevant to glyphosate evaluation (e.g. crop compositional analysis, gene flow, protein characterization).
- Publications where glyphosate or a relevant metabolite were not the focus of the publication.
- Secondary information including scientific and regulatory reviews[11].
- Articles dealing with political / socio / economic analysis.
- Observations caused by mixture of compounds / potentially causal factors and thus not attributable to a substance of concern (e.g. mixture toxicity).
- Study design, test system, species tested, exposure routes etc. that are not relevant for the European regulatory purposes.
- Findings not related to ecotoxicology, toxicology, residues, and environmental fate.
- Publications not dealing with EU representative uses / conditions (e.g. field locations, soil properties, non-EU monitoring etc.).

[11] Reviews have been partly evaluated on full text level as well – case by case decision.

- Publications dealing with a Roundup[12] formulation / other glyphosate formulations that is not the representative formulation for the AIR5 dossier and thus not relevant to the EU glyphosate renewal.
- Publications dealing with general pesticide exposures (not glyphosate specific).
- Publications generating endpoints that are not relatable to the EU level regulatory risk assessment (e.g. findings based on enzyme, cellular and molecular level etc.).
- Opinion articles where no new data is provided that can be used for the EU regulatory risk assessment.

2.4.2 Additional criteria for articles on the health and exposure of glyphosate

The scientific literature on the health effects of glyphosate can be subdivided in two main parts:

- Articles containing data on glyphosate acid and salts and on the reference glyphosate formulation MON 52276, and
- Articles only containing data on glyphosate formulations and/or co-formulants that have a composition different from that of the reference formulation MON 52276.

In the case of articles only relating to glyphosate formulations *in vitro* testing with the exception of cell/tissue systems[13] that are likely to come in direct contact with formulations and glyphosate formulations containing other active ingredients are excluded. The reason for the exclusion of *in vitro* testing of formulations to assess health effects as a result of systemic exposure is the presence of surfactants which produce cell toxicity based on the destabilization of the cell membrane and the mitochondrial membrane thus masking the specific toxicity of glyphosate. The toxicity of the co-formulants in combination with glyphosate is dependent on the concentration and the nature of the co-formulants and can be addressed on a case-by-case basis during the evaluation of formulations on an ad-hoc basis through Zonal and Member State formulation registrations.

In the relevance of glyphosate data, those articles have been considered as not relevant (and reliable) for the assessment for systemic toxicity when only *in vitro* results are presented with glyphosate concentrations above 1 mM. This is because it is physiologically not possible to attain such concentrations in standard regulatory *in vivo* testing due to the limited oral bioavailability (approx. 20%), very low dermal absorption, and rapid systemic elimination of glyphosate in *in vivo* test systems. It thus makes no sense to include such data in the risk assessment of glyphosate. Exceptions can be made in the event of direct contact with formulations resulting in localized effects, but then there is the contribution of the toxicity of the co-formulants which can be better addressed in the evaluation of formulations on an ad-hoc basis through Zonal and Member State formulation registrations.

[12] Roundup is a brand that contains multiple glyphosate-based herbicides, that contain different co-formulants. Of most importance to the toxicity profile associated with a particular product is whether that product contains a surfactant polyethoxylated tallow amine (also polyoxyethyleneamine, POEA) which is not permitted for use in the EU. As the performance / efficacy of herbicidal formulations is dependant on the surfactant system / co-formulants, the findings in articles dealing with POEA based Roundup formulations cannot be related to the representative formulation MON 52276 which is quaternary-ammonium based (and not POEA based).

[13] Glyphosate-based herbicides (GBH) contain surfactants that destabilize the cell membrane and the mitochondrial membrane and thus produce a toxicity that is not representative for glyphosate (see Levine S. L. et al, *Cell Biol. Toxicol. (2007) 23:385-400*). This has been clearly demonstrated in the scientific literature and also in some papers reviewed for this submission where *in vitro* glyphosate toxicity is compared against that of GBH and surfactants.

The limit of 1 mM has been based on the single dose oral pharmacokinetic data of a formulation containing 71.7% w/w glyphosate where an oral dose of 1,430 mg/kg bw in the rat gives plasma levels of 38.1 µg/mL or 0.225 mM after 2 hours. When extrapolated linearly (which is possible for glyphosate because it is not subject to hepatic metabolism) this gives plasma levels of 53.3 µg/mL or 0.315 mM at 2 hours after oral intake of 2,000 mg/kg bw and 107 µg/mL or 0.630 mM at 2 hours after oral intake of 4,000 mg/kg bw. A systemic concentration of glyphosate of 1 mM would then represent an oral dose of more than 6,000 mg/kg bw which is completely unreasonable for repeat dose experimental *in vivo* testing under today's OECD test guidelines. The ADI for glyphosate of 0.5 mg/kg bw/day corresponds with a daily systemic concentration of 0.17 µg/mL or 1 µM when a 60 kg person with 36 L extracellular fluid is considered with a glyphosate oral bioavailability of 20%. The daily systemic dose of glyphosate on the day of application (i.e. highest exposure day), based on the geometric mean of 3.2 µg/L in urine, of glyphosate applicators in the US is approx. 0.0001 mg/kg bw/day (Acquavella, 2004[14]) which is 1000 times less than the systemic dose (0.1 mg/kg bw) corresponding with the ADI oral dose of 0.5 mg/kg bw with 20% oral bioavailability.

Many articles that have been considered relevant for the risk assessment of glyphosate and have been assessed for reliability on full text basis, contain experimental data as well on glyphosate as such as on formulations (different from MON 52276) and co-formulants. In such cases, only the toxicology data pertinent to glyphosate and to the reference formulation (if that can be clearly stated by the author of the article) are summarized and discussed. In the case of articles on exposure monitoring and epidemiology, exposure to glyphosate formulations are considered.

2.4.3 Categorization of "relevant" articles at full-text level

Articles that were not excluded in the detailed assessment (see **Chapter 2.4.1** and **2.4.2**) were categorized as recommended in the EFSA 2092 GD - EFSA Journal 2011;9(2):2092, Point 5.4.1.

Category A *Studies that provide data for establishing or refining risk assessment parameters. These studies should be summarised in detail following the subsequent steps of the OECD Guidance documents (OECD, 2005; 2006) and should be considered for reliability.*

Category B Studies that are relevant to the data requirement, but in the opinion of the applicant provide only supplementary information that does not alter existing risk assessment parameters. A justification for such a decision should be provided.

Category C Studies for which relevance cannot be clearly determined. For each of these studies the applicants should provide an explanation of why the relevance of such studies could not be definitively determined.

The list of Category A articles can be found in **Table 32** and **Table 33**. The list of Category B articles and the justifications can be found in **Table 34** and **Table 35**. The list of Category C articles and the explanations can be found in **Table 36** and **Table 37**.

All articles (and their translations) evaluated at full text level (detailed assessment) were submitted to the AGG in a Portable Document Format (PDF).

[14] Acquavella J. F. *et al.* (2004), Environmental Health Perspectives, 112(3), 321-326.

2.5 Reliability assessment

For articles, which were identified, in the detailed assessment, as relevant articles of Category A (see **Chapter 2.4.3**) a reliability assessment was performed. The reliability criteria for each technical section are summarized in **Table 21** - **Table 23**.

For relevant articles of Category A that were classified either as reliable (without restrictions) or reliable with restrictions, summaries were compiled.
Articles of Category A which were classified as non-reliable were downgraded to articles of Category B and justification for such a decision was provided.

Table 21: Reliability criteria for ecotoxicology, environmental fate and residues

Applied for	Reliability criteria
Ecotoxicology, Environmental Fate, Residues	For guideline-compliant studies (GLP studies): OECD, OPPTS, ISO, and others. The validity/quality criteria listed in the corresponding guidelines are met.
Ecotoxicology, Environmental Fate, Residues	(No) previous exposure to other chemicals is documented (where relevant).
Ecotoxicology	For aquatic studies, the test substance is dissolved in water or where a carrier is required, it is appropriate (non-toxic) and a carrier control / positive control is considered in the test design.
Environmental Fate, Residues	The test substance is dissolved in water or non-toxic solvent.
Ecotoxicology, Environmental Fate, Residues	Test item is sufficiently documented, and reported (i.e. purity, source, content, storage conditions).
Ecotoxicology	For tests including vertebrates, compliance of the batches used in toxicity studies compared to the technical specification.
Ecotoxicology	Species used in the experiment are clearly reported, including source, experimental conditions (where relevant): strain, adequate age/life stage, body weight, acclimatization, temperature, pH, oxygen (dissolved oxygen for aquatic tests) content, housing, light conditions, humidity (terrestrial species) incubation conditions, feeding.
Ecotoxicology	The validity criteria from relevant test guidelines can be extrapolated across different species but not necessarily across different test designs. If different, then the nature of the difference and impact should ideally be discussed.
Ecotoxicology, Environmental Fate, Residues	Only glyphosate or its metabolites is the test substance (excluding mixture), and information on application of the test substance is described.
Ecotoxicology, Environmental Fate, Residues	The endpoint measured can be considered a consequence of glyphosate (or a glyphosate metabolite).
Ecotoxicology, Environmental Fate, Residues	Study design / test system is well described, including when relevant: concentration in exposure media (dose rates, volume applied, etc.), dilution/mixture of test item (solvent, vehicle) where relevant.
Ecotoxicology, Environmental Fate, Residues	Analytical verifications performed in test media (concentration) / collected samples, stability of the test substance in test medium should be documented.

Applied for	Reliability criteria
Ecotoxicology	The test has been performed in several dose levels (at least 3) including a positive / negative control where relevant.
Ecotoxicology	Suitable exposure throughout the whole exposure period was demonstrated and reported.
Ecotoxicology	A clear concentration response relationship is reported – in studies where the dose response test design is employed.
Ecotoxicology	A sufficient number of animals per group to facilitate statistical analysis reported: mortality in control groups reported, observations/findings in positive/negative control clearly reported (where relevant).
Ecotoxicology, Environmental Fate, Residues	Assessment of the statistical power of the assay is possible with reported data.
Ecotoxicology, Environmental Fate, Residues	Statistical methodology is reported (e.g., checking the plots and confidence intervals).
Ecotoxicology	Description of the observations (including time-points), examinations, and analyses performed, with (where relevant) dissections being well documented.
Ecotoxicology	For terrestrial ecotoxicological studies in the laboratory or the field, the substrates used should be adequately described e.g. nature of substrate i.e. species of leaf or soil type.
Ecotoxicology, Environmental Fate, Residues	Field locations relevant / comparable to European conditions.
Ecotoxicology, Environmental Fate, Residues	Characterization of soil: texture (sandy loam, silty loam, loam, loamy sand), pH (5.5-8.0), cation exchange capacity, organic carbon (0.5-2-5%), bulk density, water retention, microbial biomass (~1% of organic carbon).
Ecotoxicology, Environmental Fate	Other soils where information on characterization by the parameters: pH, texture, CEC, organic carbon, bulk density, water holding capacity, microbial biomass.
Ecotoxicology, Environmental Fate, Residues	For tests including agricultural soils, they should not have been treated with test substance or similar substances for a minimum of 1 year.
Ecotoxicology, Environmental Fate	For soil samples, sampling from A-horizon, top 20 cm layers; soils freshly from field preferred (storage max 3 months at 4 +/- 2°C).
Ecotoxicology, Environmental Fate, Residues	Data on precipitation is recorded.
Environmental Fate	The temperature was in the range between 20-25°C and the moisture was reported.
Environmental Fate	The presence of glyphosate identified in samples were collected from European groundwater, soil, surface waters, sediments or air.
Ecotoxicology	For lab terrestrial studies, the temperature was appropriate to the species being tested and generally should fall within the range between 20-25°C and soil moisture / relative humidity was reported.
Ecotoxicology	For bee studies, temperature of the study should be appropriate to species.
Ecotoxicology	For lab aquatic studies:
	The source and / or composition of the media used should be described.
	The temperature of the water should be appropriate to the species being tested and generally fall within the 15-25ºC.

Applied for	Reliability criteria
Ecotoxicology, Residues	The residue data can be linked to a clearly described GAP table, appropriate in the context of the renewal of approval of glyphosate (crop, application method, doses, intervals, PHI).
Ecotoxicology, Environmental Fate, Residues	Analytical results present residues measurements which can be correlated with the existing residues definition of glyphosate, and where relevant its metabolites.
Ecotoxicology, Environmental Fate, Residues	Analytical methods are clearly described; and adequate statement of specificity and sensitivity of the analytical methods is included.
Ecotoxicology	Assessment of the ECX for the width of the confidence interval around the median value; and the certainty on the level of protection offered by the median ECX is reported.
Environmental Fate	Radiolabel characterization: purity, specific activity, location of label is reported.
Environmental Fate	If degradation kinetics are included: data tables / model description / statistical parameters for kinetic fit to be provided.
Environmental Fate, Residues	Monitoring data: description of matrix analysed, and analytical methods to be fully described.
Environmental Fate	Clear description of application rate and relevance to approved uses.
Overall assessment: Reliable / Reliable with restrictions / Not reliable	

Table 22: Reliability criteria for toxicology – epidemiology and exposure studies

Reliability criteria – toxicology	
Epidemiology studies	**Exposure studies**
Guideline-specific	**Guideline-specific**
Study in accordance to valid internationally accepted testing guidelines/practices.	Study in accordance to valid internationally accepted testing guidelines/practices.
Study completely described and conducted following scientifically acceptable standards.	Study performed according to GLP.
	Study completely described and conducted following scientifically acceptable standards.
Test substance	**Test substance**
Exposure to formulations with only glyphosate as a.i.	Exposure to formulations with only glyphosate as a.i.
Exposure to formulations with glyphosate combined with other a.i.	Exposure to formulations with glyphosate combined with other a.i.
Exposure to various formulations of pesticides.	Exposure to various formulations of pesticides.
Study	**Study**
Study design – epidemiological method followed.	Study design clearly described.
Description of population investigated.	Population investigated sufficiently described.
Description of exposure circumstances.	Exposure circumstances sufficiently described.
Description of results.	Sampling scheme sufficiently documented.
Have confounding factors been considered.	Analytical method described in detail.
Statistical analysis.	Validation of analytical method reported.
	Monitoring results reported.
Overall assessment: Reliable / Reliable with restrictions / Not reliable	

Table 23: Reliability criteria for toxicology – *in vitro* and *in vivo* studies

Reliability criteria – toxicology and metabolism	
***In vitro* studies**	***In vivo* studies**
Guideline-specific	**Guideline-specific**
Study in accordance to valid internationally accepted testing guidelines.	Study in accordance to valid internationally accepted testing guidelines.
Study performed according to GLP.	Study performed according to GLP.
Study completely described and conducted following scientifically acceptable standards.	Study completely described and conducted following scientifically acceptable standards.
Test substance	**Test substance**
Test material (Glyphosate) is sufficiently documented and reported (i.e. purity, source, content, storage conditions).	Test material (Glyphosate) is sufficiently documented and reported (i.e. purity, source, content, storage conditions).
Only glyphosate acid or one of its salts is the tested substance .	Only glyphosate acid or one of its salts is the tested substance.
AMPA or other glyphosate metabolite is the tested substance.	AMPA or other glyphosate metabolite is the tested substance.
Study	**Study**
Test system clearly and completely described.	Test species clearly and completely described.
Test conditions clearly and completely described.	Test conditions clearly and completely described.
Metabolic activation system clearly and completely described.	Route and mode of administration described.
Test concentrations in physiologically acceptable range (< 1 mM).	Dose levels reported.
Cytotoxicity tests reported.	Number of animals used per dose level reported.
Positive and negative controls.	Method of analysis described for analysis test media.
Complete reporting of effects observed.	Validation of the analytical method.
Statistical methods described.	Analytical verifications of test media.
Historical negative and positive control data reported.	Complete reporting of effects observed.
Dose-effect relationship reported.	Statistical methods described.
	Historical control data of the laboratory reported.
	Dose-effect relationship reported.
Overall assessment: Reliable / Reliable with restrictions / Not reliable	

3 Search results

The full outcome of the literature search and evaluation is provided below.

Table 24: Summary of the literature search – all technical sections

	Number	Justification
Total number of articles retrieved from the search.	3297	n.a.
Total number of articles after removal of duplicates within all databases.	1781	n.a.
Total number of articles after manual removal of duplicates. [a)]	880	n.a.
Number of articles excluded after rapid assessment (title / abstract).	786	See the Literature Review Excel File.
Total number of full-text documents assessed in detail.	94	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	30	See Table 38
Number of articles not excluded after detailed assessment. [b)]	64	See Table 32-Table 37
Number of summaries presented in the dossier. [c)]	9	See Table 32, Table 33

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 25: Results of the article selection process for ecotoxicology

	Number	Justification
Total number of articles after manual removal of duplicates. [a)]	133	n.a.
Number of articles excluded after rapid assessment (title / abstract).	107	See the Literature Review Excel File.
Total number of full-text documents assessed in detail.	26	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	10	See Table 38
Number of articles not excluded after detailed assessment. [b)]	16	See Table 32-Table 37
Number of summaries presented in the dossier. [c)]	3	See Table 32, Table 33

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 26: Results of the article selection process for environmental fate

	Number	Justification
Total number of articles after manual removal of duplicates. [a)]	91	n.a.
Number of articles excluded after rapid assessment (title / abstract).	84	See the Literature Review Excel File.
Total number of full-text documents assessed in detail.	7	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	4	See Table 38
Number of articles not excluded after detailed assessment. [b)]	3	See Table 32-Table 37
Number of summaries presented in the dossier. [c)]	3	See Table 32, Table 33

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 27: Results of the article selection process for residues

	Number	Justification
Total number of articles after manual removal of duplicates. [a)]	26	n.a.
Number of articles excluded after rapid assessment (title / abstract).	15	See the Literature Review Excel File.
Total number of full-text documents assessed in detail.	11	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	2	See Table 38
Number of articles not excluded after detailed assessment [b)]	9	See Table 32-Table 37
Number of summaries presented in the dossier [c)]	0	See Table 32, Table 33

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 28: Results of the article selection process for toxicology

	Number	Justification
Total number of articles after manual removal of duplicates [a)]	117	n.a.
Number of articles excluded after rapid assessment (title / abstract).	67	See the Literature Review Excel File.
Total number of full-text documents assessed in detail	50	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	14	See Table 38
Number of articles not excluded after detailed assessment [b)]	36	See Table 32-Table 37
Number of summaries presented in the dossier [c)]	3	See Table 32, Table 33

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 29: Results of the article selection process for analytical methods

	Number	Justification
Total number of articles after manual removal of duplicates [a)]	67	n.a.
Number of articles excluded after rapid assessment (title / abstract).	67	See the Literature Review Excel File.
Total number of full-text documents assessed in detail.	n.a.	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	n.a.	n.a.
Number of articles not excluded after detailed assessment [b)]	n.a.	n.a.
Number of summaries presented in the dossier [c)]	n.a.	n.a.

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 30: Results of the article selection process for efficacy / agronomy

	Number	Justification
Total number of articles after manual removal of duplicates. [a)]	372	n.a.
Number of articles excluded after rapid assessment (title / abstract).	372	See the Literature Review Excel File.
Total number of full-text documents assessed in detail.	n.a.	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	n.a.	n.a.
Number of articles not excluded after detailed assessment. [b)]	n.a.	n.a.
Number of summaries presented in the dossier. [c)]	n.a.	n.a.

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 31: Results of the article selection process for "other non-relevant categories"

	Number	Justification
Total number of articles after manual removal of duplicates. [a)]	74	n.a.
Number of articles excluded after rapid assessment (title / abstract).	74	See the Literature Review Excel File.
Total number of full-text documents assessed in detail.	n.a.	n.a.
Number of articles excluded after detailed assessment (*i.e.* not relevant).	n.a.	n.a.
Number of articles not excluded after detailed assessment. [b)]	n.a.	n.a.
Number of summaries presented in the dossier. [c)]	n.a.	n.a.

[a)] After removal of duplicates within the current search (Jul 2020 – Dec 2020) and entries found already in the previous searches (Jan 2010 – Jun 2020). Additional duplicates occurred due to different update frequencies within each database and entries of publications ahead of print.

[b)] All relevant articles by full-text belonging to the relevance Category A, B, C (acc. to the EFSA Journal 2011;9(2):2092, Point 5.4.1). For details, please refer to Chapter 2.4.3.

[c)] Summaries were compiled for relevant articles of Category A and classified either as reliable or reliable with restrictions.

Table 32: Relevant (category A) & reliable or reliable with restrictions articles after detailed assessment: sorted by data requirement(s)

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
1	CA 5.8.3	Ferramosca A. et al.	2021	Herbicides glyphosate and glufosinate ammonium negatively affect human sperm mitochondria respiration efficiency.	Reproductive Toxicology (2021), Vol. 99, pp. 48-55	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
2	CA 5.9.4	Shrestha S. et al.	2020	Pesticide use and incident Parkinson's disease in a cohort of farmers and their spouses.	Environmental Research (2020), Vol. 191, Article No. 110186	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.
3	CA 5.9.4	Werder E. J. et al.	2020	Herbicide, fumigant, and fungicide use and breast cancer risk among farmers' wives.	Environmental Epidemiology (2020), Vol. 4, No. 3, Article No. e097	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.
4	CA 7.1.4.2	Albers C. N. et al.	2020	Leaching of herbicidal residues from gravel surfaces - A lysimeter-based study comparing gravels with agricultural topsoil.	Environmental pollution (2020), Vol. 266, Article No. 115225	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
5	CA 7.5	Papagiannaki D. et al.	2020	Effect of UV-A, UV-B and UV-C irradiation of glyphosate on photolysis and mitigation of aquatic toxicity.	Scientific Reports (2020), Vol. 10, No. 1, Article No. 20247	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.
6	CA 7.5	Tauchnitz N. et al.	2020	Assessment of pesticide inputs into surface waters by agricultural and urban sources - A case study in the Querne/Weida catchment, central Germany.	Environmental pollution (2020), Vol. 267, Article No. 115186	The article describes pesticide analyses, amongst them glyphosate, in surface waters and in soil samples within a German catchment area (CA 7.5). Additionally, batch adsorption (CA 7.1.3) and anaerobic soil degradation experiments (CA 7.1.1.2) were conducted. For CA 7.5, the article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for CA 7.5 is provided. For CA 7.1.1.2 and CA 7.1.2, refer to Table 34 and Table 35 (below). In order to complete the final statistics in this literature review report (see chapter *Summary* and *Search results*), the article has been allocated under Category A despite the outcome on CA 7.1.1.2 and CA 7.1.2.

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
7	CA 8.2.2, CA 8.2.2.1, CP 10.2.2	Forner-Piquer I. et al.	2021	Differential impact of dose-range glyphosate on locomotor behavior, neuronal activity, glio-cerebrovascular structures, and transcript regulations in zebrafish larvae.	Chemosphere (2021), Vol. 267, Article No. 128986	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
8	CA 8.2.2, CP 10.2.2	Du-Carree J. L. et al.	2021	Impact of chronic exposure of rainbow trout, Oncorhynchus mykiss, to low doses of glyphosate or glyphosate-based herbicides.	Aquatic toxicology (2021), Vol. 230, Article No. 105687	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
9	CA 8.3.1.4, CP 10.3.1.5, CP 10.3.1.6	Odemer R. et al.	2020	Chronic High Glyphosate Exposure Delays Individual Worker Bee (Apis mellifera L.) Development under Field Conditions.	Insects (2020), Vol. 11, No. 10, Article No. 664	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.

Table 33: Relevant (category A) & reliable or reliable with restrictions articles after detailed assessment: sorted by author(s)

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
4	Albers C. N. et al.	CA 7.1.4.2	2020	Leaching of herbicidal residues from gravel surfaces - A lysimeter-based study comparing gravels with agricultural topsoil.	Environmental pollution (2020), Vol. 266, Article No. 115225	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
8	Du-Carree J. L. et al.	CA 8.2.2, CP 10.2.2	2021	Impact of chronic exposure of rainbow trout, Oncorhynchus mykiss, to low doses of glyphosate or glyphosate-based herbicides.	Aquatic toxicology (2021), Vol. 230, Article No. 105687	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
1	Ferramosca A. et al.	CA 5.8.3	2021	Herbicides glyphosate and glufosinate ammonium negatively affect human sperm mitochondria respiration efficiency.	Reproductive Toxicology (2021), Vol. 99, pp. 48-55	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
7	Forner-Piquer I. et al.	CA 8.2.2, CA 8.2.2.1, CP 10.2.2	2021	Differential impact of dose-range glyphosate on locomotor behavior, neuronal activity, glio-cerebrovascular structures, and transcript regulations in zebrafish larvae.	Chemosphere (2021), Vol. 267, Article No. 128986	The article has been classified as relevant by full text - Category A and reliable with restrictions: A detailed summary for this article is provided.
9	Odemer R. et al.	CA 8.3.1.4, CP 10.3.1.5, CP 10.3.1.6	2020	Chronic High Glyphosate Exposure Delays Individual Worker Bee (Apis mellifera L.) Development under Field Conditions.	Insects (2020), Vol. 11, No. 10, Article No. 664	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.
5	Papagiannaki D. et al.	CA 7.5	2020	Effect of UV-A, UV-B and UV-C irradiation of glyphosate on photolysis and mitigation of aquatic toxicity.	Scientific Reports (2020), Vol. 10, No. 1, Article No. 20247	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.
2	Shrestha S. et al.	CA 5.9.4	2020	Pesticide use and incident Parkinson's disease in a cohort of farmers and their spouses.	Environmental Research (2020), Vol. 191, Article No. 110186	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
6	Tauchnitz N. et al.	CA 7.5	2020	Assessment of pesticide inputs into surface waters by agricultural and urban sources - A case study in the Querne/Weida catchment, central Germany.	Environmental pollution (2020), Vol. 267, Article No. 115186	The article describes pesticide analyses, amongst them glyphosate, in surface waters and in soil samples within a German catchment area (CA 7.5). Additionally, batch adsorption (CA 7.1.3) and anaerobic soil degradation experiments (CA 7.1.1.2) were conducted. For CA 7.5, the article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for CA 7.5 is provided. For CA 7.1.1.2 and CA 7.1.2, refer to Table 34 and Table 35 (below). In order to complete the final statistics in this literature review report (see chapter *Summary* and *Search results*), the article has been allocated under Category A despite the outcome on CA 7.1.1.2 and CA 7.1.2.
3	Werder E. J. et al.	CA 5.9.4	2020	Herbicide, fumigant, and fungicide use and breast cancer risk among farmers' wives.	Environmental Epidemiology (2020), Vol. 4, No. 3, Article No. e097	The article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for this article is provided.

Table 34: Relevant but supplementary (category B) articles after detailed assessment: sorted by data requirement(s)

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
10	CA 5.1	Faniband M. H. et al.	2021	Human experimental exposure to glyphosate and biomonitoring of young Swedish adults.	International journal of hygiene and environmental health (2021), Vol. 231, Art. No. 113657	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides only supplementary information on kinetics of glyphosate in human volunteers but not altering risk assessment. No information on the test item and its source or purity. Only one dose level was tested and biomonitoring was restricted to urinary excretion.
11	CA 5.4, CA 5.5, CA 5.6	Skanes B. et al.	2021	Hazard assessment using an in-silico toxicity assessment of the transformation products of boscalid, pyraclostrobin, fenbuconazole and glyphosate generated by exposure to an advanced oxidative process.	Toxicology in vitro : an international journal published in association with BIBRA (2021), Vol. 70, Art. No. 105049	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: Article provides only supplementary information on in silico evaluation of genotoxicity, acute oral toxicity or carcinogenicity but not altering risk assessment. Only one type of software was used for each endpoint. Toxtree was used to address Cramer classification, Ames test, carcinogenicity / mutagenicity, DNA binding and micronucleus assay. Toxicity estimation software tool (TEST) was used to address developmental toxicity and the rat oral LD50. The toxicity evaluation based on single software was considered not robust enough.
12	CA 5.5	Crump K. et al.	2020	Correcting for Multiple Comparisons in Statistical Analysis of Animal Bioassay Data.	Toxicological Sciences (2020) Vol. 177, Issue 2, pp. 523-524	The article has been classified as relevant by full text - Category B for the following reason: In this letter to Editor Crump et al. (2021) commented on Rusyn et al. (*Questioning Existing Cancer Hazard Evaluation Standards in the Name of Statistics. Toxicol Sci. (2020), Vol. 177, Issue 2, pp. 521-522*) where Rusyn et al. comments on the original Crump et al. article (*Accounting for Multiple Comparisons in Statistical Analysis of the Extensive Bioassay Data on Glyphosate. Toxicol Sci. (2020) Vol. 175, Issue 2, pp. 156-167*). The original Crump et al. article was evaluated in the previous search and classified as relevant by full text (Category A and reliable without restrictions). The summary of the article was presented in the dossier under MCA 5.5./026. The appropriateness of the approach presented in the original article has been further reiterated in a Letter to the Editor (*Crump K. et al., Toxicological Sciences (2020), Vol. 177, Issue 2, pp. 523-524, Correcting for Multiple Comparisons in Statistical Analysis of Animal Bioassay Data*). Crump et al. replied to Rusyn et al. (*Questioning existing cancer hazard evaluation standards in the name of statistics. Toxicol Sci. (2020), Vol. 177, Issue 2, pp. 521-522*) and explain that the statistical method used in their analysis of the extensive bioassay data on glyphosate provides adequate interpretation of the p-values. They state that before a p-value can be interpreted appropriately, it must be correct, i.e., it must reflect the correct false positive rate for the hypothesis under consideration. The statistical method used in their analysis of the extensive bioassay data on glyphosate provides p-values that correct false positive rates by properly accounting for the multitude of tumours that require analysis by standard statistical methods. As the Letter to the Editor provides only supplementary information to the original Crump et al. article and does not alter risk assessment, the letter was

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
						classified as relevant by full text but of Category B (relevant but supplementary).
13	CA 5.6, CA 5.8.3	Lorenz V. et al.	2020	Perinatal exposure to glyphosate or a glyphosate-based formulation disrupts hormonal and uterine milieu during the receptive state in rats.	Food and chemical toxicology (2020), Vol. 143, Art. No. 111560	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The article is not reliable for the following reason: The study does not follow any OECD testing guideline, therefore the experimental design and procedures should be not only explained but validated against appropriate reference substances and the interpretation of the results should be supported by adequate historical control data that allow the correct interpretation of the relevance of a change. This is particularly true when assessing the biological relevance of hormonal changes and/or the assessed gene expression. In this publication such data are not provided. It is not clear why only 9 F1 females/group were selected to assess the effects on the pre-implantation phase and not a higher number to cover the basal hormonal variations observed, which should be high based on the scattered values observed in the control group of this study. The authrors claim that there was an imbalance in the serum levels of estradiol 2 in relation to progesterone, but the progesterone values were apparently not impacted. Similarly, they claim that glyphosate induced significantly the ERα expression at protein level subepithelial stroma of the uteri (which was not observed in other parts of the uterus), although no changes were observed in ERα mRNA expression but do not take into consideration the inconsistency of their results. Similarly, they concluded that glyphosate provoked aberrant expression on implantation-genes although a consistent response was not observed among all the tested genes. The reproductive performance data of F1 females is not reported in a transparent way: only selected photos of the uterus are presented to indicate that there was a decrease in the number of implantation sites. However, the actual number of the implantation sites per animals are not reported. Similarly the number of corpora lutea, resorption sites and preimplantation loss are represented in graphics (figure 2A, B and C), but the actual number have not been given. So, the authors do not provide the reader of an objective information to understand whether an effect did occur. Overall, this publication presents several deficiencies and bias in reporting the results of their investigations and as such is considered to be not reliable.
14	CA 5.6.1	Milesi M. M. et al.	2020	Correction to: Response to comments on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats (Correction to Archives of Toxicology (2019) 93:3635–3638).	Archives of Toxicology (2020), Vol. 94, No. 8, pp. 2897–2898	The article has been classified as relevant by full text - Category B for the following reason: This is a serie of comments and corrections connected to the article by Milesi et al. (*Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2018), Vol. 92, No. 8, pp. 2629-2643*). This article was evaluated in the previous search and classified as relevant by full text - Category B. In order to reflect the category of the main article, the correction was also classified as Category B. The correction corrects Table 1 of the publication, which lists factors associated with the pre-implantation loss rate and factors associated with feto-placental parameters of F2 offspring in control and glyphosate-based herbicede-treated female rats.

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
						The serie contains e.g. following articles, comments and corrections: Milesi et al., Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2018);92(8):2629-2643. Plewis, Comment on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2019);93(1):207. Milesi et al., Response to comments on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2019);93(12):3635-3638. Paumgartten, Comment on Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats, Arch Toxicol 92:2629-2643 : On the impairment of female reproductive performance by developmental exposure to a glyphosate-based herbicide. Arch Toxicol. (2019);93(3):831-832. Plewis, Comment on response from Milesi et al. to Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2020);94(1):351-352. Milesi et al., Correction to: Response to comments on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2020);94(8):2897-2898.
15	CA 5.6.2	Refaie A. A. et al.	2020	DNA and liver damage induced by glyphosate herbicide in suckling pups of wistar rat.	Current Topics in Toxicology (2020), Vol. 16, pp. 205-214	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The article is not reliable for the following reason: Storage conditions of test item not reported. Animal strain not further specified and age of dams not reported. No analysis of test item in solvent performed. Insufficient number of animals/group tested. It should be noted that the experimental unit for such an experimental design is the litter, not the individual pups. Therefore, statistical evaluations should have been conducted to compare across litters, where n = 2, affording only one degree of freedom for statistical comparisons.
16	CA 5.7	Coullery R. et al.	2020	Exposure to glyphosate during pregnancy induces neurobehavioral alterations and downregulation of Wnt5a-CaMKII pathway.	Reproductive toxicology (2020), Vol. 96, pp. 390-398	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides useful information on neonates rats administered glyphosate after gestational exposure, but not altering risk assessment. In addition, IP injection is not a preferred route of administration for human exposure. Only 2 dose levels were tested and no information on the purity of glyphosate was reported. No analytical determinations performed. No historical control data provided. Lack of positive control and information allowing to assess the robustness of the investigations and results.
17	CA 5.7	Masood M. I. et al.	2020	Environment permissible concentrations of glyphosate in drinking water can influence the fate of neural	Environmental pollution (2020), Vol. 270, Art. No. 116179	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on neurotoxicty (in vitro experiment), but does not alter risk assessment. The reporting on the test material is limited. Ca2+ uptake

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
				stem cells from the subventricular zone of the postnatal mouse.		was investigated at too high concentrations not relevant for assessment (> 1mM), but the remaining endpoints were investigated at suitable concentrations (< 1 mM). No positive or negative controls were included and historical control data were not provided.
18	CA 5.8.2	Babich R. et al.	2020	Kidney developmental effects of metal-herbicide mixtures: Implications for chronic kidney disease of unknown etiology.	Environment international (2020), Vol. 144, Art. No. 106019	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on kidney effects of glyphosate and does not alter risk assessment. The purpose of the publication was to investigate the possible causes of chronic kidney disease of unknown etiology (CKDu) which is an emerging global concern affecting several agricultural communities in the Americas and South Asia. The hypothesis was that exposure to contaminants such as heavy metals (e.g., Cd, As, Pb, and V) and organic pesticides (e.g., glyphosate) present in the drinking water could provoke the onset and progression of this disease in childhood. Using zebrafish Danio rerio, a toxicology and kidney disease model, the authors examined kidney developmental effects of exposure to (i) environmentally derived samples from CKDu endemic and non-endemic regions and (ii) Cd, As, V, Pb, and glyphosate as individual compounds and in mixtures. The authors found that drinking water is contaminated with various organic chemicals including nephrotoxic compounds as well as heavy metals, but at levels considered safe for drinking. Histological studies and gene expression analyses examining markers of kidney development (pax2a) and kidney injury (kim1) showed novel metal and glyphosate-metal mixture specific effects on kidney development. Glyphosate showed that interactive nephrotoxic effects of organic agrochemicals and heavy metals are an important consideration. For example, glyphosate at 10 ppb can induce kim1, implying that exposure to this chemical even at very low-levels can contribute to kidney injury. They postulate that exposure to glyphosate coupled with individuals with impaired kidney development is likely to increase the initiation and progression of CKDu. However, gene expression data also suggest, when in a mixture with metals such as arsenic, glyphosate may have alternate effects on kidneys, including effects that may not be detrimental. Test system of the study is not clearly and completely described. Metabolic activation system is not clearly and completely described. Cytotoxicity tests are not reported. Only 1 dose level was used which does not allow a dose response analysis. Furthermore, no positive control and no HCD provided.
19	CA 5.8.2	Ghosh S. et al.	2020	Cardiogenic shock with first-degree heart block in a patient with glyphosate-surfactant poisoning.	Tropical doctor (2020): Ahead of print. 10.1177/0049475520971594	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper is a case report that describes the case of a 34-year-old man who developed corrosive injury to his GI tract after ingesting 200 mL of formulated glyphosate. He went on to develop hypotension and transient multiorgan failure including myocardial dysfunction which improved with intensive supportive care. This sequence of events is not unexpected in large ingestions of formulated glyphosate.

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
20	CA 5.8.2	Hao J. Y. et al.	2020	Glyphosate-induced Delayed Pyloric Obstruction, Ulcer and Scar Changes.	Journal of the College of Physicians and Surgeons-Pakistan (2020), Vol. 30, No. 8, pp. 868-870	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper describes a case report of a 44-year-old woman who presented with pyloric obstruction two months after accidentally ingesting 100 mL of formulated glyphosate. After the initial ingestion, her family took her to the hospital where the patient was treated for 13 days and then discharged. She later returned to the hospital with recurrent nausea & vomiting, underwent endoscopy where they discovered scarring and pyloric obstruction. The patient underwent a partial gastrectomy and gastrojejunostomy with improvement of symptoms. This clinical course of events is not unexpected in significant ingestions of formulated glyphosate as these ingestions are corrosive and can cause scarring & gastric outlet obstruction.
21	CA 5.8.2	Kimura T. et al.	2020	Renal tubular injury by glyphosate-based herbicide.	Clinical and experimental nephrology (2020), Vol. 24, No. 12, pp. 1186	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This is a case report with an image showing proximal tubular epithelial injury in a 78-year-old woman who ingested formulated glyphosate in a suicide attempt. This ingestion resulted in transient renal failure which improved with hemodialysis. This in not unexpected in large suicidal ingestions.
22	CA 5.8.2	Nayak S. et al.	2020	Deliberate self-poisoning in south odisha: study of its clinical profile and outcome.	Asian Journal of Pharmaceutical and Clinical Research (2020), Vol. 13, No. 8, pp. 169-173	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper aimed to characterize the nature of self-poisoning in the Odisha region of India. Over a 2-year period they evaluated 200 patients who presented to the Maharaja Krishna Medical College and found that 149 (74.5%) patients had ingested pesticides. 10 patients ingested glyphosate. 9 developed nausea & vomiting, 2 developed corrosive injury to their GI tracts, 2 had pneumonitis likely due to aspiration, 2 developed hypotension, 2 had altered mental status, 2 developed dysrhythmias, 3 had dysphagia, 3 had dehydration & 2 died. There was certainly overlap in the clinical picture as there are more symptoms described than patients. The symptoms described are not unexpected as large ingestions of formulated glyphosate causes corrosive injury to the GI tract and subsequent hypotension & multiorgan failure.
23	CA 5.8.2	Ren Y. et al.	2020	Case report of pyloric obstruction caused by glyphosate herbicides.	Acta Medica Mediterranea (2020), Vol. 36, No. 6, pp. 3485-3488	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper is a case series describing 3 patients with formulated glyphosate ingestions. The authors describe pyloric obstruction and laryngeal scarring in the patients. Formulated glyphosate is caustic to the GI tract and airways so this clinical scenario is not unexpected.
24	CA 5.8.2	Shin J. et al.	2020	Severe chemical burns related to dermal exposure to herbicide containing glyphosate and glufosinate with surfactant in Korea.	Annals of occupational and environmental medicine (2020), Vol. 32, Art. No. e28	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This article is a case report detailing an injury sustained by a farmer who was reportedly spraying a glyphosate/glufosinate herbicide formulation, spilled the contents of his back pack on his right shoulder & hip, did not wash the formulation off and presented 3 days after with rapidly progressive necrotizing wounds that have a necrotizing fasciitis appearance in the photos. Unfortunately,

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
						the patient succumbed to his injuries. These herbicides are not corrosive to the skin in this fashion, it is impossible to tell what the farmer was exposed to in this scenario as infectious processes can result in a very similar clinical appearance. This is completely atypical and should not be associated with glyphosate exposure.
25	CA 5.8.2	Stajnko A. et al.	2020	Seasonal glyphosate and AMPA levels in urine of children and adolescents living in rural regions of Northeastern Slovenia.	Environment international (2020), Vol. 143, Art. No. 105985	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper aimed to measure glyphosate and AMPA exposure in children & adolescents in Slovenian agricultural areas. They measured 1st morning urines in the 246 participants in the winter and again in 225 participants in the summer. They addressed the fact that the detection of AMPA could come from other detergent exposures and not from glyphosate alone. 221 blood samples were also drawn in the first sampling period. They detected glyphosate in 27% of the urine samples from the winter and 22% in the summer. Their data demonstrate much lower glyphosate concentrations than reported in other parts of the world. A large percentage of the children had concentrations less than the LOQ with 72% of the younger children & 74% of the older children testing below the LOQ in the first sampling period, and 79% of the younger & 76 % of the older testing below the LOQ in the 2nd period. The estimated systemic dose of glyphosate was 0.003 mcg/kg of body weight – significantly below the ADI of 0.1 mg/kg of body weight. This article supports the evidence that glyphosate exposures tend to be very low and don't pose a health risk.
26	CA 5.8.2	Xiao L. et al.	2021	A 9-year retrospective study of poisoning-related deaths in Southwest China (Sichuan).	Forensic Science International (2021): Ahead of Print 10.1016/j.forsciint.2020.110558	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper describes retrospective study evaluating 782 poisoning deaths in Sichuan Province, China. The deaths were characterized as accidental, suicidal or homicidal. Pesticide ingestion was responsible for 40% of deaths. Only 2 deaths were related to glyphosate formulations and no details were given about the cases.
27	CA 5.8.3	Abdel-Halim K. Y. et al.	2020	Cytotoxicity and Oxidative Stress Responses of Imidacloprid and Glyphosate in Human Prostate Epithelial WPM-Y.1 Cell Line.	Journal of Toxicology (2020), Vol. 2020, Art. No. 4364650	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on cytotoxicity of glyphosate on prostate cells that does not alter risk assessment. The ability of glyphosate to induce in vitro cytotoxic and oxidative stress on normal human cells (prostate epithelial WPM-Y.1 cell line) was evaluated with the methyl tetrazolium test (MTT) and histopathological investigation. Cell viability was evaluated with an MTT test for 24 h. The median inhibition concentration (IC50) value was 0.025 mM for glyphosate. At low concentrations (mM), the examined pesticides significantly reduced cell viability and caused cell death. Coupling of cell viability, oxidative stress, and histopathological alterations provides good tools to assess the cytotoxicity of pesticides in vitro at low concentrations. Moreover, the abnormal damage of cell structure is considered an important signal of organ dysfunction. Metabolic activation system was not clearly and completely described. No HCD and no positive or negative control were reported.

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
28	CA 5.8.3	Ben Maamar M. et al.	2020	Epigenome-wide association study for glyphosate induced transgenerational sperm DNA methylation and histone retention epigenetic biomarkers for disease.	Epigenetics (2020): Ahead of print. 10.1080/15592294.2020.1853319	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: The article provides only supplementary information on epigenetic effects of glyphosate and does not alter risk assessment. The current study was designed to identify epigenetic biomarkers for glyphosate-induced transgenerational diseases using an epigenome-wide association study (EWAS). Following transient glyphosate exposure of gestating female rats (F0 generation), during the developmental period of gonadal sex determination, the subsequent transgenerational F3 generation, with no direct exposure, were aged to 1 year and animals with specific pathologies identified. The pathologies investigated included prostate disease, kidney disease, obesity, and presence of multiple disease. The sperm were collected from the glyphosate lineage males with only an individual disease and used to identify specific differential DNA methylation regions (DMRs) and the differential histone retention sites (DHRs) associated with that pathology. Unique signatures of DMRs and DHRs for each pathology were identified for the specific diseases. However, a comparison of DMRs and DHRs of the glyphosate treated animals versus the control animals was not performed. It is not clear what has been actually tested. Test conditions are not clearly and completely described. Only one dose level was reported / no dose-response relationship. Number of animals used per dose level not reported. Method of analysis was not described for analysis test media (no validation, no verifications). Furthermore, no HCD reported, and no positive controls.
29	CA 5.8.3	Diers S. et al.	2020	Does glyphosate affect the in vitro maturation and further development of bovine oocytes? Original Title: Beeinflusst Glyphosat die In-vitro-Maturation und weitere Entwicklung boviner Oozyten?	Zuechtungskunde (2020), Vol. 92, No. 4, pp. 223-235	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides supplementary information on endocrine disruption, but not altering risk assessment. It is difficult to be interpreted because no HCD and no positive controls were used. The data requirement for endocrine disruption is not met, since neither mode of action nor ED properties are sufficiently shown due to no dose-response relationship for gene induction. In addition, the product used in the study is not sufficiently identified, the test substance was identified only as 'Roundup'. The surfactant system in the formulated product used in this study was not confirmed by the author. It is therefore not possible to confirm whether the product used, is the representative glyphosate formulation MON 52276 relevant for the glyphosate EU renewal and whether the product contained POEA or not.
30	CA 5.8.3	Ganesan S. et al.	2020	Ovarian mitochondrial and oxidative stress proteins are altered by glyphosate exposure in mice.	Toxicology and applied pharmacology (2020), Vol. 402, Art. No. 115116	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: This publication does not alter risk assessment negatively, since no (major) effects were found with any of the tested read outs. However, it could be used - with restrictions - as supporting evidence for lack of any effects of test item on liver, heart, spleen, kidney or uterine weight, AKT or gamma-H2AX protein abundance, or the ovarian level of steroidogenic proteins, or on estrous cyclicity and circulating E2 or P4. The study was performed following scientifically acceptable standards. However, reliability is given with restrictions since details on test item (e.g. purity), historical control data, positive controls and analysis of test media are missing.

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
31	CA 5.8.3	Ingaramo P. et al.	2020	Are glyphosate and glyphosate-based herbicides endocrine disruptors that alter female fertility?	Molecular and cellular endocrinology (2020), Vol. 518, Art. No. 110934	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The review article selectively reports results of in vitro and in vivo studies suggesting endocrine disrupting properties of glyphosate and glyphosate-based herbicides at low or "environmentally relevant" dose levels in the female reproductive tissue. Most of the studies focused on the endocrine-disrupting effects of glyphosate in endocrine-dependent tissues (ovary and uterus). The authors claim that most of these studies show effects at very low concentrations, which would be undetected in traditional toxicology studies. However, they did not adequately explain the design of the experiments, address potential confounders in the cited studies (e.g., overt and systemic toxicity, cytotoxicity) that impact the studies validity to inform an endocrine assessment, nor the reasons why the reported investigations can detect effects that the comprehensive database of regulatory toxicity studies for glyphosate were not able to ascertain. The most significant flaw with this review was the omission of numerous reliable and relevant published in vitro and in vivo studies, and publicly available regulatory assessments, that are critical to inform a weight of evidence assessment for glyphosate and GBHs. The missing information was largely included in the recent 2017 EFSA Glyphosate ED weight of evidence evaluation where it was concluded that glyphosate is not an endocrine disruptor. Figure 1 proposes mechanisms of endocrine disruption that include impact on aromatase activity, estrogenic effects through a ligand-independent mechanism, cell proliferation, and expression of oestrogen-dependent proteins. It was concluded in the recent 2015 USEPA and 2017 EFSA weight of evidence ED assessments that glyphosate does not impact steroidogenesis including aromatase activity. Findings in the articles cited in figure 1 for aromatase activity are confounded by non-specific effects of supraphysiological concentrations of the surfactant in these formulations in in vitro or in vivo systems. There is no evidence of glyphosate impacting aromatase expression or activity by assessing apical endpoints in the comprehensive toxicology database for glyphosate (for review see Levine et al. 2020). Figure 1 also purports that glyphosate is a ligand for the oestrogen receptor. It has been well established that glyphosate in not a ligand for the oestrogen receptor and does not transactivate the oestrogen responsive genes endpoints (for a comprehensive review of the oestrogen pathway see Levine et al. 2020). The paper cited in figure 1 to support a ligand-independent mechanism by Mesnage et al. 2017 was reported to only occur at the unrealistic exposure concentration of 20,000 mg glyphosate a.e./L (118 µm) and by activating protein kinase A that increases the phosphorylation and activation of the oestrogen receptor. Mesnage et al. did not provide evidence in their paper that the phosphorylation status of the oestrogen receptor was changed to support their hypothesis nor is this hypothesis consistent with the weight of evidence from validate functional assays. Figure 1 also proposes that glyphosate can cause cell proliferation through and endocrine mechanism. This hypothesis is inconsistent

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						with results of the comprehensive database of glyphosate toxicology studies. The key citation that support this hypothesis is by Thongprakaisang et al. 2013. Mesnage et al. 2017 concluded the results in Thongprakaisang et al. 2013 likely result from contamination and not glyphosate. An earlier study that reported modest proliferation by glyphosate only occurred at the extremely high concentration of 1000 μM and the authors concluded that the modest proliferation observed in their study resulted from a non-endocrine mechanism (Lin and Garry, 2000). The final endocrine mechanism described in figure 1 refers to expression of oestrogen-dependent proteins. The significance of these findings is questionable based on the results of the endocrine screening battery reviewed by EFSA in 2017 and the comprehensive regulatory toxicology database for glyphosate. The authors, however, recognize that it was not possible to reproduce in vivo most of the effects of glyphosate and/or GBHs observed in vitro. They claim this could be due that the species tested are not the appropriate ones and claimed that the sheep constitute a highly appropriate model to evaluate the effects of EDCs due to the similarity between sheep and humans, especially regarding gestational and thyroid physiologies and brain ontogeny. However, robust data supporting this assumption are limited.
32	CA 5.8.3	Levine S. L. et al.	2020	Review and analysis of the potential for glyphosate to interact with the estrogen, androgen and thyroid pathways. Special Issue: Glyphosate exposure and toxicology.	Pest Management Science (2020), Vol. 76, No. 9, pp. 2886-2906	The article has been classified as relevant by full text - Category B for the following reason: The article is a review article providing a good summary and also further analysis on possible endocrine disrupting properties of glyphosate in USEPAs endocrine disruptor screening program (EDSP) and further literature but does not alter risk assessment.
33	CA 5.8.3	Munoz J. P. et al.	2020	Glyphosate and the key characteristics of an endocrine disruptor: A review.	Chemosphere (2020): Ahead of print. doi.org/10.1016/j.chemosphere.2020.128619	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. Munoz et al. based on the ten key characteristics (KC) of Endocrine Disrupting Chemicals (EDCs) recently proposed (La Merrill et al., 2020) reviewed a selective set of publications related to glyphosate as a possible endocrine disruptor. The authors claim that glyphosate exhibited eight of the ten KCs of an EDC. This checklist of KC was not created in conjunction with nor is it recognised by any regulatory agency as a replacement for established weight of evidence approaches used by regulatory agencies to assess whether a compound is an endocrine disruptor. The authors did not perform a systematic review for glyphosate of the publicly available information resulting in a significant flaw with this publication, the omission of numerous reliable and relevant published in vitro and in vivo studies, and publicly available regulatory assessments, that are critical to inform a weight of evidence assessment for glyphosate. Glyphosate has undergone extensive regulatory testing and assessment to evaluate its potential to be an endocrine disruptor. In 2015 the US EPA released its weight of evidence evaluation of glyphosate and more recently the European Food Safety Authority in 2017, who

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						independently performed an endocrine assessment as part the of the glyphosate renewal process. Both agencies concluded based on the US EPA EDSP battery and all other scientifically relevant information that glyphosate does not interact with the oestrogen, androgen thyroid and steroidogenic pathways and concluded that glyphosate is not an endocrine disruptor. Furthermore, the cited studies in Munoz et al. 2020 were not critically evaluated for relevance and reliability nor evaluated with a weight of evidence to conclude whether the criteria for each key characteristic was met. The authors state "*Here, we conduct a comprehensive review where we describe the most important findings of the glyphosate effects in the endocrine system and assess the mechanistic evidence to classify it as and EDC*". However, many of the studies the authors cite as evidence for glyphosate meeting one of the KC they used studies that were conducted with a glyphosate-based formulation only. The authors generally focused on a small subset of papers that used non-standard in vitro methods that tested glyphosate-based formulations at unrealistically high levels and in vivo studies that don't follow international guidelines. These papers inflate the relevance of findings derived from their in vitro models to the in vivo situation and invariably fail to discuss or recognize confounding effects of the formulation. As a result, these papers are not considered to be reliable for an endocrine assessment.
34	CA 5.8.3	Toth G. et al.	2020	Cytotoxicity and hormonal activity of glyphosate-based herbicides.	Environmental pollution (2020), Vol. 265, No. Pt B, Art. No. 115027	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: This article provides only supplementary information for risk assessment, since the in vitro experiments were performed with yeast instead of human cells. Nevertheless, the findings showed, that neither glyphosate nor AMPA impaired estrogenic or androgenic activity in the test system. Purity and storage conditions of test items and historical control data not reported. Positive controls applied, but data not shown. This study claims that POEA and some glyphosate-based formulations are estrogenic and/or androgenic. However, the study does not provide reliable information that POEA or any of the tested formulations are estrogenic and/or androgenic. The results claiming estrogenicity and/or androgenicity of the formulations are not in agreement with what would be predicted based on chemical structures of the surfactants and are apparently confounded by cytotoxicity based on responses presented within the paper. Because of the surface-active properties (i.e. surfactant properties) of POEA and other surfactants, it is very difficult to generate interpretable results from in vitro or cell-based assays, like the yeast assay, with surfactants. Rather, conclusions of estrogenicity and androgenicity should be based on in vivo studies. Even if the activity levels claiming estrogenic or androgenic activity are taken at face value, their potency for the estrogen and androgen receptors is so low these responses are not considered biologically relevant and realistic exposures to these substances are far below reported effect levels in the paper.
35	CA 5.8.3	Zhang C. et al.	2020	Molecular Basis for Endocrine Disruption by	International journal of environmental research and	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: The article provides only supplementary

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				Pesticides Targeting Aromatase and Estrogen Receptor.	public health (2020), Vol. 17, No. 16, Art. No. 5664	information on in vitro data and binding information gained by in silico models but not altering risk assessment. Limited information on test material (batch, analytical purity) provided. Historical control data were not included. The reported inhibition of aromatase activity (up to 30% at 100 µM glyphosate acid) is likely related to using ethanol or DMSO as a solvent for glyphosate, rather than water or buffer. Glyphosate is not soluble in an organic solvent, like ethanol or DMSO, and this likely confounded the results of the assay because glyphosate was not fully solubilized. Zhang et al. used recombinant CYP19 at low protein levels in the assay and did not add a "buffering protein" like BSA, which made the aromatase enzyme, and its associated reductase, susceptible to denaturization. Consistent with denaturing the aromatase enzyme, the slope of the inhibition curve was extremely shallow, uncharacteristic of aromatase inhibition, and likely reflects confounding effects of undissolved test substance. In the USEPA's test guideline for aromatase activity, activity of < 25% is considered negative and activity between 25% and < 50% is considered equivocal. Greater than 50% inhibition must be estimated for a substance to be considered positive in EPA's guideline study.
36	CA 5.8.3	Zhang J. et al.	2021	Melatonin alleviates the deterioration of oocytes and hormonal disorders from mice subjected to glyphosate.	Molecular and cellular endocrinology (2021), Vol. 520, Art. No. 111073	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The publication investigates whether melatonin can improve reproductive defects caused by glyphosate. No new information on glyphosate toxicity is provided and the article does not alter risk assessment. There is a limited information on test material provided (no information on source, batch or purity), limited information on test animals (no information on housing, environmental conditions or weight), no historical control data provided.
37	CA 5.8.3	Fu H. et al.	2020	Effects of glyphosate-based herbicide-contaminated diets on reproductive organ toxicity and hypothalamic-pituitary-ovarian axis hormones in weaned piglets.	Environmental pollution (2020): Ahead of print. doi.org/10.1016/j.envpol.2020.115596	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The article is not reliable for the following reason: The study did not follow any OECD guideline and was not performed under GLP conditions. No analytical verifications of the test item in the diet were performed. In addition, there was no information on food consumption reported, therefore the actual intake of glyphosate by the animals remains unclear. The piglet tested in the study is an animal species that is not routinely used to investigate reproductive performances. The authors did not provide information on the sexual maturation in the tested strain which would have helped in the interpretation of parameters like the hormone levels and histopathology of the uterus and in the ovaries. Overall, for piglets that have been used in the recent years for investigation on potential effects on reproductive toxicity induced by a xenobiotic, it has been reported that in sexually immature animals a reliable histopathological and functional evaluation of possible test item–related effects on the female reproductive organs is not possible (1-4). In this study hormonal analyses has been performed only once at sacrifice when for reliable interpretation of the data, hormonal analysis should have been taken more times on the same animal (ideally before the treatment) and the time of sampling should be recorded. Therefore, the reliability of the hormonal data in this study is also

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						questionable. In conclusion, the study presents many deficiencies and does not meet the basic scientific principles for this type of investigation and is it considered not to be reliable.
38	CA 5.8.3, CP 7.1.7	Spinaci M. et al.	2020	Glyphosate and its formulation Roundup impair pig oocyte maturation.	Scientific reports (2020), Vol. 10, No. 1, Art. No. 12007	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on maturation, steroidogenesis and oxidative stress markers of cumulus-oocyte complexes (COCs) from pigs, but not altering risk assessment. In addition, effects were mainly found at unphysiologically high doses (> 1 mM). The purity and storage conditions of the test item were not reported. No cytotoxicity testing performed, no positive and truly negative controls performed and also no historical control data provided. No metabolic activation system applied.
39	CA 6.10.1	de Souza Ferreira; A. P. et al.	2020	Glyphosate and aminomethylphosphonic acid (AMPA) residues in Brazilian honey.	Food Additives & Contaminants, Part B: Surveillance (2020): Ahead of Print doi.org/10.1080/19393210.2020.1855676	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Glyphosate residues were found in Brazilian honey (HR = 0.22 mg/kg). An AMPA residue of 0.1 mg/kg was detected in one sample. The residue levels found in the analysed samples are not directly relevant to the EU uses supported in the AIR dossier. However, the data may be useful to interpret the results of the EU monitoring data for glyphosate residues in honey. Therefore, they are considered as category B (supplementary information). The publication is reliable in most points, however origin of samples is not described in full detail.
40	CA 6.10.1	Panseri S. et al.	2020	Pesticides and Environmental Contaminants in Organic Honeys According to Their Different Productive Areas toward Food Safety Protection.	Foods (2020), Vol. 9, No. 12	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Monitoring data from organic honey samples (n = 98) collected in Italy (Apulia) during 2019-2020. Residues of glyphosate, AMPA and glufosinate were not found in any sample. References are provided to validation of analytical methods. Source of honey samples are not exactly described.
41	CA 6.10.1	Petcu C. D. et al.	2020	Study regarding the honey contamination degree assessed in a specialized production unit.	Scientific Papers, Series D. Animal Science (2020), Vol. 63, No. 1, pp. 442-449	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Samples from "honey sourced from beekeepers from the centre and Southern Romania (in order to form a large and homogeneous batch)" were analysed. Analysis done by LC-MS/MS with poor method description and no validation data. Residues of glyphosate were below the limit of quantification (<0.01 mg/kg) in 15 acacia and 15 polyfloral honey samples.
42	CA 6.10.1	Yaqub G. et al.	2020	Monitoring and risk assessment due to presence of metals and pesticides residues in honey samples from the major honey producing forest belts and different brands.	Food Science and Technology (2020), Vol. 40, No. Suppl. 1, pp. 331-335	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: 25 samples of different national (Pakistan) and international honey brands were collected for analysis of residues of heavy metals and pesticides. Glyphosate residues were detected in 5 samples in a range of 0.44 - 3.5 mg/kg (ppm). The residue levels found in the analysed samples are not directly relevant to the EU uses supported in the AIR dossier. However, the data may be useful to interpret the results of the EU monitoring data for glyphosate residues in honey. Therefore, they are considered as category B (supplementary information). The publication is reliable, but with several restrictions, i.e. missing validation data, analytical method and origin of samples

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						are not sufficiently described.
43	CA 6.3	Gomez-Ramos M. d. M. et al.	2020	Pesticide residues evaluation of organic crops. A critical appraisal.	Food Chemistry: X 5 (2020), Art. No. 100079	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Analytical method development and optimisation for detection of multiple pesticides in crops with low LOQ. Monitoring data from 136 commercial organic samples showed no residues of glyphosate, n-acetyl glyphosate, AMPA, n-acetyl-AMPA. Origin of samples not fully described. For method validation it is relied on published data.
44	CA 6.3	Khan N. et al.	2020	Assessment of Health Risk due to Pesticide Residues in Fruits, Vegetables, Soil, and Water.	Journal of Chemistry (2020), Vol. 2020, Art. No. 5497952	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, does not alter risk assessment. Fruit, vegetable, soil and water samples from Pakistan were analysed for glyphosate residues (monitoring), with detects in fruits and vegetables. Missing validation data, analytical method and origin of samples not sufficiently described.
45	CA 6.3	Lozowicka B. et al.	2019	Pesticide residues in seeds of winter oilseed rape (Brassica napus L.).	Progress in Plant Protection (2019), Vol. 59, No. 4, pp. 199-205	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Monitoring data from OSR samples collected in Poland during 2016-2019. Glyphosate residues found in 14% of samples (max 0.27 mg/kg). Analytical method not fully described, origin of samples not fully described.
46	CA 6.5.3	Tittlemier S. A. et al.	2020	Fate of glyphosate in wheat during milling and bread production.	Cereal Chemistry (2020): Ahead of Print DOI: 10.1002/cche.10369	The article has been classified relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only. No endpoint is derived. The study does not alter risk assessment. This study is considered supportive for processing of wheat, however no clear processing factors can be derived. Absence of validation data in different processed wheat matrices. For the analytical method it is referred to another publication (Tittlemier et al., 2017).
47	CA 6.9	Solomon K. R.	2020	Estimated exposure to glyphosate in humans via environmental, occupational, and dietary pathways: an updated review of the scientific literature. Special Issue: Glyphosate exposure and toxicology.	Pest Management Science (2020), Vol. 76, No. 9, pp. 2878-2885	The article has been classified as relevant by full text - Category B and reliable without restrictions for the following reason: The article provides only supplemental information, which does not alter risk assessment. No endpoint was derived. Extended risk assessment using published exposure data for air, water, bystanders, the general public, domesticated animals, pets, and applicators. Based on this large dataset, no risk to any exposure pathway/group was identified. The article is reliable with respect to risk assessment methodologies applied, i.e. well described methodologies and data set for analysis.
6	CA 7.1.3, CA 7.1.1.2	Tauchnitz N. et al.	2020	Assessment of pesticide inputs into surface waters by agricultural and urban sources - A case study in the Querne/Weida catchment, central Germany.	Environmental pollution (2020), Vol. 267, Art. No. 115186	The article describes pesticide analyses, amongst them glyphosate, in surface waters and in soil samples within a German catchment area (CA 7.5). Additionally, batch adsorption (CA 7.1.3) and anaerobic soil degradation experiments (CA 7.1.1.2) were conducted. For CA 7.5, the article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for CA 7.5 is provided. Please refer to Tables 32 and 33 above. For CA 7.1.1.2 and CA 7.1.2, see below.

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						The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability** for CA 7.1.1.2 and CA 7.1.3 for the following reason: CA 7.1.1.2: For the anaerobic degradation experiment, the methods are well described, however the experimental design is not in agreement with the relevant guideline (OECD 307), e.g. due to use of synthetic rainwater, insufficient information on the test concentrations, use of slurry of a liquid-solid ratio of 0.3:1, air-tight incubation and analysis of pore water, only. From the information provided, it cannot be concluded on the representativeness of the soils used. Further, besides the final half-live, no detailed results are reported. Thus, no conclusion can be made on the quality of the results. The results from the anaerobic degradation experiment are therefore considered **not reliable**. CA 7.1.3: For the batch adsorption experiment, the methods are well described, however the experimental design is not in agreement with the relevant guideline (OECD 106), e.g. due to use of synthetic rainwater instead of CaCl2 solution, insufficient information on the test concentrations and a temperature of 10 °C. From the information provided, it cannot be concluded on the representativeness of the soils used. Further, besides the final adsorption parameters, no detailed results are reported. Thus, no conclusion can be made on the quality of the results. The adsorption results are therefore considered **not reliable**.
48	CA 8.1.4, CP 10.1.3	Cuzziol Boccioni A. P. et al.	2020	Toxicity assessment at different experimental scenarios with glyphosate, chlorpyrifos and antibiotics in Rhinella arenarum (Anura: Bufonidae) tadpoles.	Chemosphere (2020), Art. No. 128475, Ahead of print. doi.org/10.1016/j.chemosphere.2020.128475	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The study does not alter risk assessment but the findings of the work could serve to discuss the sublethal effects (biological, morphological and enzymatic parameters) of two different glyphosate concentrations (1.25 and 2.5 mg/L) to tadpoles of an amphibian species as part of a broader weight of evidence. An endpoint cannot be derived. No analytical verifications of the test item concentrations are provided. Surface egg strings of R. arenarum used for the experiments were collected from temporary small ponds situated in the natural floodplain of the Parana River, considered as an unpolluted site (no analytical verification was however made). Only two concentrations were tested.
49	CA 8.2.4.2, CP 10.2.1	Asnicar D. et al.	2020	Effects of Glyphosate-Based and Derived Products on Sea Urchin Larval Development.	JOURNAL OF MARINE SCIENCE AND ENGINEERING (2020), Vol. 8, No. 9, Art. No. 661	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: Provides information on the effects of glyphosate, AMPA and Roundup on the larval development of sea urchins but no risk assessment relevant endpoints are given. The study does not alter risk assessment. The purity of glyphosate and AMPA are not provided. The urchins were collected from the open environment and could have been exposed previously to pesticides. The experimental conditions are inadequately described (it is unclear if oxygen saturation > 80% applies to all treatment or just for respiration rate treatment). Light conditions are not reported. No validation data or analytical verifications are provided. No Ecx assessment was conducted.
50	CA 8.2.6.1, CA 8.2.7,	Tajnaiova L. et al.	2020	Determination of the Ecotoxicity of Herbicides	Plants-Basel (2020), Vol. 9, No. 9, Article No. 1203	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: This study investigates the effect of

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	CP 10.2.1			Roundup (R) Classic Pro and Garlon New in Aquatic and Terrestrial Environments.		Roundup® Classic Pro (not relevant for the AIR5, as it contains the additive surfactant ether alkylamine ethoxylate) and AMPA on the aquatic organisms duckweed Lemna minor and green algae Desmodesmus subspicatus and on the enzymatic activity of soil. The endpoints for AMPA do not alter risk assessment but are supportive of low exposure risk (relevant growth inhibition endpoints obtained for both green algae and macrophytes: Desmodesmus subspicatus (green alga): 72 h AMPA IC50 = 117.8 mg/L; 72 h AMPA IC50 with pH adjusted solution = 192.1 mg/L). No analytical verifications of the test item concentrations in the medium were conducted. The experimental design was carried out according to the following standards: EN ISO 8692 (Water Quality-Fresh Water Algal Growth Inhibition Test with Unicellular Green Algae (ISO 8692:2012)) and EN ISO 20079 (Water Quality-Determination of the Toxic Effect of Water Constituents and Waste Water on Duckweed (Lemna minor)-Duckweed Growth Inhibition Test (ISO 20079:2005)). Only the IC50 assessment was performed. There is no analytical to confirm exposure. Results are also ambiguous in that % inhibition plots are presented but data presented is unknown (rate or biomass or cell density?).
51	CA 8.3.1.1.2, CA 8.3.1.4, CP 10.3.1.1.2, CP 10.3.1.4, CP 10.3.1.6	Motta E. V. S. et al.	2020	Oral or Topical Exposure to Glyphosate in Herbicide Formulation Impacts the Gut Microbiota and Survival Rates of Honey Bees.	Applied and environmental microbiology (2020), Vol. 86, No. 18	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: No proper endpoints are provided (only acute toxicity at 24h). The study does not alter risk assessment, but the findings of the work could serve to support the acute contact toxicity to bees and further sub-lethal effects of glyphosate (mortality) on honey bees as part of a broader discussion. Both laboratory and field experiments were conducted. The study is focused on the effects of glyphosate on bee gut microbiota. The glyphosate standard tested item is not fully described. No analytical verifications of the test item concentrations in the medium were conducted. Study is not compliant with any accepted guideline and therefore validity criteria cannot be assessed. Glyphosate was tested topically at different concentrations and only EC50 assessment (at 24 h instead of at 48 h as recommended by the guidance) was performed. A dose-response effect was observed in several parameters studied (not only mortality). For the field experiments, there is no security that the bees haven't been exposed to pesticides before the tests started. Findings cannot be related directly to impacts at the population level therefore influence on direct level and indirect assessment is uncertain. Nor is this a study type driven by data requirements. In additon, the tested formulation is not related to the representative formulation for the AIR5 (MON 52276).
52	CA 8.3.1.2, CP 10.3.1.2	Almasri H. et al.	2020	Mixtures of an insecticide, a fungicide and a herbicide induce high toxicities and systemic physiological disturbances in winter Apis mellifera honey bees.	Ecotoxicology and environmental safety (2020), Vol. 203, Art. No. 111013	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Provides information on the effects of glyphosate on the survival of honey bees (at 3 different concentrations after 20 days continuous oral exposure) but no risk assessment relevant endpoints are given. The study does not alter risk assessment. Individual daily food consumption was not provided (it was calculated by dividing the food consumed per cage by the number of bees that remained alive each day in each cage. The

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						same as suggested by the OECD TG 245). No ECx assessment was conducted. The pesticide concentrations in the sugar solution were checked by GC-MS/MS but values were not reported in article. The test is not performed according to the OECD TG 245 chronic oral toxicity test (longer exposure) and therefore it is not possible to properly assess validity criteria (control mortality after 10 days). Whilst the study presents survival data, the test was conducted as an extended laboratory based study with a 20 day duration. This does not reflect an accepted test design used for Annex I renewal purposes. Despite 14 cages of 30 bees being for each exposure regimen, (cage design is not described), there are no standard error bars presented for the replication so the relevance of the proposed survival lines cannot be established from Figure 1, where survival in the glyphosate only groups, appears to be in the 80-90% up until day 12-15 and then at this point there appears also to be an effect in the control with survival dropping off sharply. A further point is that there is no positive control group for the DMSO used to enable dispersal of the substances. The influence of this on the overall toxicity is uncertain. Despite what appears to be a reliable test, there are some shortcomings in the test design.
53	CA 8.3.1.2, CP 10.3.1.2	Strobl V. et al.	2020	Positive Correlation between Pesticide Consumption and Longevity in Solitary Bees: Are We Overlooking Fitness Trade-Offs?	Insects (2020), Vol. 11, No. 11, Art. No. 819	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Provides information on the survival of solitary bees after chronic exposure to glyphosate (at 1 single concentrations after 10 days continuous oral exposure) but no risk assessment relevant endpoints are given. The study does not alter exisiting risk assessment. Although the Osmia bicornis tested adults were obtained from cocoons reared in the laboratory, original individuals were transferred from organic orchards in Germany and previous pesticide exposure cannot be totally excluded. Measured parameters are not clearly described and there seems to be an error/typo in the glyphosate dose at which the bees were exposed. Sucrose solution consumption was recorded but no analytical verifications of the test item concentrations in the medium were conducted. No guidance document is available yet for lab studies with solitary bees. No ECx assessment was conducted for any of the parameters studied.
54	CA 8.3.1.4, CP 10.3.1.4	Delkash-Roudsari S. et al.	2020	Assessment of lethal and sublethal effects of imidacloprid, ethion, and glyphosate on aversive conditioning, motility, and lifespan in honey bees (Apis mellifera L.).	Ecotoxicology and environmental safety (2020), Vol. 204, Art. No. 111108	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: No endpoints are provided, the study does not alter risk assessment but the findings of the work could serve to support the (low) chronic toxicity of glyphosate (sublethal effects) to honey bees as part of a broader discussion. The source of the test individuals is not clearly reported and the lack of a previous pesticide exposure cannot be excluded. The duration of the chronic study is not clear (bee lifespan) and there is no indication about the days the bees were exposed to the tested concentrations. Chronic dose metrics per bee cannot be precisely quantified. No analytical verifications of the test item concentrations in the chronic oral test were conducted. The test designs for the discrimination task and the rhythm, nicity monitoring are not recognisable for consideration at the EU level. In addition to glyphosate, RoundUp® Ready-to-Use Weed and Grass Killer were tested that cannot be related to the representative formulation for the glyphosate EU renewal (the representative formulation is

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
						MON 52276).
55	CA 8.3.2, CP 10.3.2.2	Lacava M. et al.	2021	The pest-specific effects of glyphosate on functional response of a wolf spider.	Chemosphere (2021), Vol. 262, Art. No. 127785	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: No endpoints are provided, the study does not alter risk assessment but the findings of the work could serve to support the sub-lethal effects (on the feeding rate) of glyphosate on a ground-dwelling spider as part of a broader discussion. The test substance was identified only as 'Roundup'. The surfactant system in the formulated product used in this study was not confirmed by the author. It is therefore not possible to confirm whether the product used contained POEA or not. The tested individuals were collected from native forests from Uruguay and previous pesticide exposure cannot be excluded. The tested substance has not been fully identified. A tested rate is not provided (just that a glyphosate solution with a concentration of 280 mg/L a.i. was used). Tested individuals were exposed by contact for only 30 minutes. The experiment run in glass containers only for 4 hours, so only acute effects were assessed. Only one concentration was tested. The outcome of the study not only depends on the effects of glyphosate, but also on the tested prey (different results depending on the prey). The test is not conducted according to any guidance and therefore, it is not possible to confirm whether the study meets any validity criteria.
56	CA 8.3.2.2, CP 10.3.2.2	Sekrecka M.	2019	Influence of pesticides and bioregulators on the number of predatory mite Typhlodromus pyri (Phytoseiidae). Original title: Wplyw srodkow ochrony roslin oraz bioregulatorow na liczebnosc drapieznego roztocza dobroczynka gruszowca Typhlodromus pyri (Phytoseiidae).	Zeszyty Naukowe Instytutu Ogrodnictwa (2019), Vol. 27, pp. 41-52	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides information on the mortality of T. pyri mites 7 days after exposure but no risk assessment relevant endpoint can be obtained from the study. The study does not alter risk assessment. The test item is not fully described. The tested dose in g a.s./ha is not clear. Source of the tested individuals not fully reported (conditions of the lab mass rearing). The test design and the developmental phase of the tested individuals are not relatable to EU risk assessment (apple slices sprayed using a potter tower and then after drying, animals introduced). No agreed guidance has been followed (Bluemel et al., 2000).
57	CA 8.4.2, CP 10.4.2	Alhewairini S. S.	2020	Toxicity effects of glyphosate and metribuzin on five species of soil-dwelling predatory mites.	Pakistan Journal of Agricultural Sciences (2020), Vol. 57, No. 5, pp. 1429-1435	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: Provides information on the effects of glyphosate on the mortality of 5 soil-dwelling mite species, but other than that recommended in EU Reg. 283/2013 (Data requirements for AS). No relevant endpoints for the risk assessment are given. The study does not alter risk assessment. No real dose was provided: 1.1 L (glypho-48 or glyphosate as AS)/100L water, but it is unclear how many L of solution applied per ha? Individuals collected in the field with no information about those sites and previous exposures to pesticides. No clear information about maintainance of the mites previous to treatments in the laboratory. The experimental conditions (temperature and soil) are inadequately described and no validation data or analytical verifications are provided. No ECx assessment was conducted. The test is not performed according to any OECD guideline.
58	CA 8.6.2,	Fernandes	2020	Ecotoxicological Assessment	Applied Sciences (2020),	The article has been classified as relevant by full text - Category B and reliable

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
	CP 10.6.2	B. et al.		of a Glyphosate-Based Herbicide in Cover Plants: Medicago sativa L. as a Model Species.	Vol. 10, No. 15, Art. No. 5098	with restrictions for the following reason: The study does not alter risk assessment. All validity criteria according to OECD TG 208 cannot be evaluated. Test concentrations are not confirmed by analytical verifications. Only one tested species. In addition, the formulation tested is a potassium salt, whereas the AIR5 representative formulation MON 52276 contains an isopropylammonium salt.
59	CA 8.6.2, CP 10.6.2	Jang S. J. et al.	2020	Inhibition of wheat growth planted after glyphosate application to weeds.	Weed Science (2020), Vol. 68, No. 4, pp. 373-381	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: No endpoints are provided, the study does not alter risk assessment but the findings of the work could serve to support the lack of effects of glyphosate fresh and aged residues (0, 1, 3, 5, and 7 days) after sowing wheat seeds in soils previously treated with glyphosate at 600 g ae/ha as part of a broader discussion. The formulation tested contains an ammonium salt, which has a substantially higher loading than the AIR5 representative formulation MON 52276 that contain isopropylammonium salt. The tested formulation is not fully identified. No analytical verifications of the test concentration in soil were conducted. OECD TG 208 was not followed and therefore validity criteria cannot be assessed. No emergence was investigated, only growth. No ECx assessment was conducted. The number of tested individuals is insufficient.
60	CP 7.1.7	Gateva S. et al.	2020	Direct treatment with roundup vs. treatment with plant extract previously influenced by roundup: does the genotoxic effect differ?	Dokladi na Bolgarskata Akademiya na Naukite (2020), Vol. 73, No. 7, pp. 978-984	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides only supplementary information on cytotoxicity and genotoxicity of GBH, but not altering risk assessment. No specification of glyphosate formulation (test item). No negative control (formulation without glyphosate). No historical control data. Genotoxic effects only observed at cytotoxic concentrations.
61	CP 7.1.7	Haponenko Y. Y. et al.	2019	Zinc oxide nanoparticles enhance the hepatotoxic effects of glyphosate herbicide.	Medichna ta Klinichna Khimiya (2019), No. 4, pp. 32-36	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides information about effects of glyphosate based herbicide on liver parameters of rats, but does not alter risk assessment. The product used in the study is not sufficiently identified, the test substance was identified only as 'Roundup'. The surfactant system in the formulated product used in this study was not confirmed by the author. It is therefore not possible to confirm whether the product used contained POEA or not. Furthermore, study procedure, test species and animal housing conditions are not adequately described.
62	CP 7.1.7	Tizhe E. V. et al.	2020	Effect of zinc supplementation on chronic hepatorenal toxicity following oral exposure to glyphosate-based herbicide (Bushfire®) in rats.	The Journal of international medical research (2020), Vol. 48, No. 8, pp. 1-15	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: The publication investigates whether zinc supplementation can improve toxicity caused by glyphosate. No new information on glyphosate toxicity itself is provided and the article does not alter risk assessment. Many important basic paramaters which are standard in the conduct and reporting of toxicology studies are absent; food consumption, body weight, body weight gain, clinical signs, diarrhea, etc. In addition, gavage of a surfactant containing mixture for 36 weeks would likely result in gastrointestinal effects, such are ulcers in the forestomach of rats, and necropsies were not performed to evaluate this significant consequence of repeated gavaging of surfactant. With the absence of recorded liver weights, potential adaptive responses of increased

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						circulating enzymes are not able to be put into context. Therefore, no context of the clinical chemistry findings can be understood.

Table 35: Relevant but supplementary (category B) articles after detailed assessment: sorted by author(s)

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
27	Abdel-Halim K. Y. et al.	CA 5.8.3	2020	Cytotoxicity and Oxidative Stress Responses of Imidacloprid and Glyphosate in Human Prostate Epithelial WPM-Y.1 Cell Line.	Journal of Toxicology (2020), Vol. 2020, Art. No. 4364650	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on cytotoxicity of glyphosate on prostate cells that does not alter risk assessment. The ability of glyphosate to induce in vitro cytotoxic and oxidative stress on normal human cells (prostate epithelial WPM-Y.1 cell line) was evaluated with the methyl tetrazolium test (MTT) and histopathological investigation. Cell viability was evaluated with an MTT test for 24 h. The median inhibition concentration (IC50) value was 0.025 mM for glyphosate. At low concentrations (mM), the examined pesticides significantly reduced cell viability and caused cell death. Coupling of cell viability, oxidative stress, and histopathological alterations provides good tools to assess the cytotoxicity of pesticides in vitro at low concentrations. Moreover, the abnormal damage of cell structure is considered an important signal of organ dysfunction. Metabolic activation system was not clearly and completely described. No HCD and no positive or negative control were reported.
57	Alhewairini S. S.	CA 8.4.2, CP 10.4.2	2020	Toxicity effects of glyphosate and metribuzin on five species of soil-dwelling predatory mites.	Pakistan Journal of Agricultural Sciences (2020), Vol. 57, No. 5, pp. 1429-1435	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: Provides information on the effects of glyphosate on the mortality of 5 soil-dwelling mite species, but other than that recommended in EU Reg. 283/2013 (Data requirements for AS). No relevant endpoints for the risk assessment are given. The study does not alter risk assessment. No real dose was provided: 1.1 L (glypho-48 or glyphosate as AS)/100L water, but it is unclear how many L of solution applied per ha? Individuals collected in the field with no information about those sites and previous exposures to pesticides. No clear information about maintainance of the mites previous to treatments in the laboratory. The experimental conditions (temperature and soil) are inadequately described and no validation data or analytical verifications are provided. No ECx assessment was conducted. The test is not performed according to any OECD guideline.
52	Almasri H. et al.	CA 8.3.1.2, CP 10.3.1.2	2020	Mixtures of an insecticide, a fungicide and a herbicide induce high toxicities and systemic physiological disturbances in winter Apis mellifera honey bees.	Ecotoxicology and environmental safety (2020), Vol. 203, Art. No. 111013	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Provides information on the effects of glyphosate on the survival of honey bees (at 3 different concentrations after 20 days continuous oral exposure) but no risk assessment relevant endpoints are given. The study does not alter risk assessment. Individual daily food consumption was not provided (it was calculated by dividing the food consumed per cage by the number of bees that remained alive each day in each cage. The same as suggested by the OECD TG 245). No ECx assessment was conducted. The pesticide concentrations in the sugar solution were checked by GC-MS/MS but values were not reported in article. The test is not performed according to the OECD TG 245 chronic oral toxicity test (longer exposure) and therefore it is not possible to properly assess validity criteria (control mortality after 10 days). Whilst the study presents survival data, the test was conducted as an extended

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
						laboratory based study with a 20 day duration. This does not reflect an accepted test design used for Annex I renewal purposes. Despite 14 cages of 30 bees being for each exposure regimen, (cage design is not described), there are no standard error bars presented for the replication so the relevance of the proposed survival lines cannot be established from Figure 1, where survival in the glyphosate only groups, appears to be in the 80-90% up until day 12-15 and then at this point there appears also to be an effect in the control with survival dropping off sharply. A further point is that there is no positive control group for the DMSO used to enable dispersal of the substances. The influence of this on the overall toxicity is uncertain. Despite what appears to be a reliable test, there are some shortcomings in the test design.
49	Asnicar D. et al.	CA 8.2.4.2, CP 10.2.1	2020	Effects of Glyphosate-Based and Derived Products on Sea Urchin Larval Development.	JOURNAL OF MARINE SCIENCE AND ENGINEERING (2020), Vol. 8, No. 9, Art. No. 661	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: Provides information on the effects of glyphosate, AMPA and Roundup on the larval development of sea urchins but no risk assessment relevant endpoints are given. The study does not alter risk assessment. The purity of glyphosate and AMPA are not provided. The urchins were collected from the open environment and could have been exposed previously to pesticides. The experimental conditions are inadequately described (it is unclear if oxygen saturation > 80% applies to all treatment or just for respiration rate treatment). Light conditions are not reported. No validation data or analytical verifications are provided. No Ecx assessment was conducted.
18	Babich R. et al.	CA 5.8.2	2020	Kidney developmental effects of metal-herbicide mixtures: Implications for chronic kidney disease of unknown etiology.	Environment international (2020), Vol. 144, Art. No. 106019	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on kidney effects of glyphosate and does not alter risk assessment. The purpose of the publication was to investigate the possible causes of chronic kidney disease of unknown etiology (CKDu) which is an emerging global concern affecting several agricultural communities in the Americas and South Asia. The hypothesis was that exposure to contaminants such as heavy metals (e.g., Cd, As, Pb, and V) and organic pesticides (e.g., glyphosate) present in the drinking water could provoke the onset and progression of this disease in childhood. Using zebrafish Danio rerio, a toxicology and kidney disease model, the authors examined kidney developmental effects of exposure to (i) environmentally derived samples from CKDu endemic and non-endemic regions and (ii) Cd, As, V, Pb, and glyphosate as individual compounds and in mixtures. The authors found that drinking water is contaminated with various organic chemicals including nephrotoxic compounds as well as heavy metals, but at levels considered safe for drinking. Histological studies and gene expression analyses examining markers of kidney development (pax2a) and kidney injury (kim1) showed novel metal and glyphosate-metal mixture specific effects on kidney development. Glyphosate showed that interactive nephrotoxic effects of organic agrochemicals and heavy metals are an important consideration. For example, glyphosate at 10 ppb can induce kim1, implying that exposure to this chemical even at very low-levels can contribute to kidney injury. They postulate that

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
						exposure to glyphosate coupled with individuals with impaired kidney development is likely to increase the initiation and progression of CKDu. However, gene expression data also suggest, when in a mixture with metals such as arsenic, glyphosate may have alternate effects on kidneys, including effects that may not be detrimental. Test system of the study is not clearly and completely described. Metabolic activation system is not clearly and completely described. Cytotoxicity tests are not reported. Only 1 dose level was used which does not allow a dose response analysis. Furthermore, no positive control and no HCD provided.
28	Ben Maamar M. et al.	CA 5.8.3	2020	Epigenome-wide association study for glyphosate induced transgenerational sperm DNA methylation and histone retention epigenetic biomarkers for disease.	Epigenetics (2020): Ahead of print. 10.1080/15592294.2020.1853319	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: The article provides only supplementary information on epigenetic effects of glyphosate and does not alter risk assessment. The current study was designed to identify epigenetic biomarkers for glyphosate-induced transgenerational diseases using an epigenome-wide association study (EWAS). Following transient glyphosate exposure of gestating female rats (F0 generation), during the developmental period of gonadal sex determination, the subsequent transgenerational F3 generation, with no direct exposure, were aged to 1 year and animals with specific pathologies identified. The pathologies investigated included prostate disease, kidney disease, obesity, and presence of multiple disease. The sperm were collected from the glyphosate lineage males with only an individual disease and used to identify specific differential DNA methylation regions (DMRs) and the differential histone retention sites (DHRs) associated with that pathology. Unique signatures of DMRs and DHRs for each pathology were identified for the specific diseases. However, a comparison of DMRs and DHRs of the glyphosate treated animals versus the control animals was not performed. It is not clear what has been actually tested. Test conditions are not clearly and completely described. Only one dose level was reported / no dose-response relationship. Number of animals used per dose level not reported. Method of analysis was not described for analysis test media (no validation, no verifications). Furthermore, no HCD reported, and no positive controls.
16	Coullery R. et al.	CA 5.7	2020	Exposure to glyphosate during pregnancy induces neurobehavioral alterations and downregulation of Wnt5a-CaMKII pathway.	Reproductive toxicology (2020), Vol. 96, pp. 390-398	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides useful information on neonates rats administered glyphosate after gestational exposure, but not altering risk assessment. In addition, IP injection is not a preferred route of administration for human exposure. Only 2 dose levels were tested and no information on the purity of glyphosate was reported. No analytical determinations performed. No historical control data provided. Lack of positive control and information allowing to assess the robustness of the investigations and results.
12	Crump K. et al.	CA 5.5	2020	Correcting for Multiple Comparisons in Statistical Analysis of Animal Bioassay Data.	Toxicological Sciences (2020) Vol. 177, Issue 2, pp. 523-524	The article has been classified as relevant by full text - Category B for the following reason: In this letter to Editor Crump et al. (2021) commented on Rusyn et al. (*Questioning Existing Cancer Hazard Evaluation Standards in the Name of Statistics. Toxicol Sci. (2020), Vol. 177, Issue 2, pp. 521-522*) where Rusyn et al. comments on the original Crump et al. article (*Accounting for Multiple Comparisons in Statistical Analysis of the Extensive Bioassay Data on*

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
						Glyphosate. Toxicol Sci. (2020) Vol. 175, Issue 2, pp. 156-167). The original Crump et al. article was evaluated in the previous search and classified as relevant by full text (Category A and reliable without restrictions). The summary of the article was presented in the dossier under MCA 5.5./026. The appropriateness of the approach presented in the original article has been further reiterated in a Letter to the Editor (*Crump K. et al., Toxicological Sciences (2020), Vol. 177, Issue 2, pp. 523-524, Correcting for Multiple Comparisons in Statistical Analysis of Animal Bioassay Data*). Crump et al. replied to Rusyn et al. (*Questioning existing cancer hazard evaluation standards in the name of statistics. Toxicol Sci. (2020), Vol. 177, Issue 2, pp. 521-522*) and explain that the statistical method used in their analysis of the extensive bioassay data on glyphosate provides adequate interpretation of the p-values. They state that before a p-value can be interpreted appropriately, it must be correct, i.e., it must reflect the correct false positive rate for the hypothesis under consideration. The statistical method used in their analysis of the extensive bioassay data on glyphosate provides p-values that correct false positive rates by properly accounting for the multitude of tumours that require analysis by standard statistical methods. As the Letter to the Editor provides only supplementary information to the original Crump et al. article and does not alter risk assessment, the letter was classified as relevant by full text but of Category B (relevant but supplementary).
48	Cuzziol Boccioni A. P. et al.	CA 8.1.4, CP 10.1.3	2020	Toxicity assessment at different experimental scenarios with glyphosate, chlorpyrifos and antibiotics in Rhinella arenarum (Anura: Bufonidae) tadpoles.	Chemosphere (2020), Art. No. 128475, Ahead of print. doi.org/10.1016/j.chemosphere.2020.128475	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The study does not alter risk assessment but the findings of the work could serve to discuss the sublethal effects (biological, morphological and enzymatic parameters) of two different glyphosate concentrations (1.25 and 2.5 mg/L) to tadpoles of an amphibian species as part of a broader weight of evidence. An endpoint cannot be derived. No analytical verifications of the test item concentrations are provided. Surface egg strings of R. arenarum used for the experiments were collected from temporary small ponds situated in the natural floodplain of the Parana River, considered as an unpolluted site (no analytical verification was however made). Only two concentrations were tested.
39	de Souza Ferreira; A. P. et al.	CA 6.10.1	2020	Glyphosate and aminomethylphosphonic acid (AMPA) residues in Brazilian honey.	Food Additives & Contaminants, Part B: Surveillance (2020): Ahead of Print doi.org/10.1080/19393210.2020.1855676	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Glyphosate residues were found in Brazilian honey (HR = 0.22 mg/kg). An AMPA residue of 0.1 mg/kg was detected in one sample. The residue levels found in the analysed samples are not directly relevant to the EU uses supported in the AIR dossier. However, the data may be useful to interpret the results of the EU monitoring data for glyphosate residues in honey. Therefore, they are considered as category B (supplementary information). The publication is reliable in most points, however origin of samples is not described in full detail.
54	Delkash-Roudsari S.	CA 8.3.1.4, CP 10.3.1.4	2020	Assessment of lethal and sublethal effects of	Ecotoxicology and environmental safety (2020),	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: No endpoints are provided, the study does not

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
	et al.			imidacloprid, ethion, and glyphosate on aversive conditioning, motility, and lifespan in honey bees (Apis mellifera L.).	Vol. 204, Art. No. 111108	alter risk assessment but the findings of the work could serve to support the (low) chronic toxicity of glyphosate (sublethal effects) to honey bees as part of a broader discussion. The source of the test individuals is not clearly reported and the lack of a previous pesticide exposure cannot be excluded. The duration of the chronic study is not clear (bee lifespan) and there is no indication about the days the bees were exposed to the tested concentrations. Chronic dose metrics per bee cannot be precisely quantified. No analytical verifications of the test item concentrations in the chronic oral test were conducted. The test designs for the discrimination task and the rhythm, nicity monitoring are not recognisable for consideration at the EU level. In addition to glyphosate, RoundUp® Ready-to-Use Weed and Grass Killer were tested that cannot be related to the representative formulation for the glyphosate EU renewal (the representative formulation is MON 52276).
29	Diers S. et al.	CA 5.8.3	2020	Does glyphosate affect the in vitro maturation and further development of bovine oocytes? Original Title: Beeinflusst Glyphosat die In-vitro-Maturation und weitere Entwicklung boviner Oozyten?	Zuechtungskunde (2020), Vol. 92, No. 4, pp. 223-235	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides supplementary information on endocrine disruption, but not altering risk assessment. It is difficult to be interpreted because no HCD and no positive controls were used. The data requirement for endocrine disruption is not met, since neither mode of action nor ED properties are sufficiently shown due to no dose-response relationship for gene induction. In addition, the product used in the study is not sufficiently identified, the test substance was identified only as 'Roundup'. The surfactant system in the formulated product used in this study was not confirmed by the author. It is therefore not possible to confirm whether the product used, is the representative glyphosate formulation MON 52276 relevant for the glyphosate EU renewal and whether the product contained POEA or not.
10	Faniband M. H. et al.	CA 5.1	2021	Human experimental exposure to glyphosate and biomonitoring of young Swedish adults.	International journal of hygiene and environmental health (2021), Vol. 231, Art. No. 113657	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides only supplementary information on kinetics of glyphosate in human volunteers but not altering risk assessment. No information on the test item and its source or purity. Only one dose level was tested and biomonitoring was restricted to urinary excretion.
58	Fernandes B. et al.	CA 8.6.2, CP 10.6.2	2020	Ecotoxicological Assessment of a Glyphosate-Based Herbicide in Cover Plants: Medicago sativa L. as a Model Species.	Applied Sciences (2020), Vol. 10, No. 15, Art. No. 5098	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The study does not alter risk assessment. All validity criteria according to OECD TG 208 cannot be evaluated. Test concentrations are not confirmed by analytical verifications. Only one tested species. In addition, the formulation tested is a potassium salt, whereas the AIR5 representative formulation MON 52276 contains an isopropylammonium salt.
37	Fu H. et al.	CA 5.8.3	2020	Effects of glyphosate-based herbicide-contaminated diets on reproductive organ toxicity and hypothalamic-pituitary-ovarian axis hormones in weaned piglets.	Environmental pollution (2020): Ahead of print. doi.org/10.1016/j.envpol.2020.115596	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The article is not reliable for the following reason: The study did not follow any OECD guideline and was not performed under GLP conditions. No analytical verifications of the test item in the diet were performed. In addition, there was no information on food consumption reported, therefore the actual intake of glyphosate by the animals remains unclear. The piglet tested in the study is an animal species that is not routinely used to investigate reproductive performances. The authors did not provide information

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
						on the sexual maturation in the tested strain which would have helped in the interpretation of parameters like the hormone levels and histopathology of the uterus and in the ovaries. Overall, for piglets that have been used in the recent years for investigation on potential effects on reproductive toxicity induced by a xenobiotic, it has been reported that in sexually immature animals a reliable histopathological and functional evaluation of possible test item–related effects on the female reproductive organs is not possible (1-4). In this study hormonal analyses has been performed only once at sacrifice when for reliable interpretation of the data, hormonal analysis should have been taken more times on the same animal (ideally before the treatment) and the time of sampling should be recorded. Therefore, the reliability of the hormonal data in this study is also questionable. In conclusion, the study presents many deficiencies and does not meet the basic scientific principles for this type of investigation and is it considered not to be reliable.
30	Ganesan S. et al.	CA 5.8.3	2020	Ovarian mitochondrial and oxidative stress proteins are altered by glyphosate exposure in mice.	Toxicology and applied pharmacology (2020), Vol. 402, Art. No. 115116	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: This publication does not alter risk assessment negatively, since no (major) effects were found with any of the tested read outs. However, it could be used - with restrictions - as supporting evidence for lack of any effects of test item on liver, heart, spleen, kidney or uterine weight, AKT or gamma-H2AX protein abundance, or the ovarian level of steroidogenic proteins, or on estrous cyclicity and circulating E2 or P4. The study was performed following scientifically acceptable standards. However, reliability is given with restrictions since details on test item (e.g. purity), historical control data, positive controls and analysis of test media are missing.
60	Gateva S. et al.	CP 7.1.7	2020	Direct treatment with roundup vs. treatment with plant extract previously influenced by roundup: does the genotoxic effect differ?	Dokladi na Bolgarskata Akademiya na Naukite (2020), Vol. 73, No. 7, pp. 978-984	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides only supplementary information on cytotoxicity and genotoxicity of GBH, but not altering risk assessment. No specification of glyphosate formulation (test item). No negative control (formulation without glyphosate). No historical control data. Genotoxic effects only observed at cytotoxic concentrations.
19	Ghosh S. et al.	CA 5.8.2	2020	Cardiogenic shock with first-degree heart block in a patient with glyphosate-surfactant poisoning.	Tropical doctor (2020): Ahead of print. 10.1177/0049475520971594	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper is a case report that describes the case of a 34-year-old man who developed corrosive injury to his GI tract after ingesting 200 mL of formulated glyphosate. He went on to develop hypotension and transient multiorgan failure including myocardial dysfunction which improved with intensive supportive care. This sequence of events is not unexpected in large ingestions of formulated glyphosate.
43	Gomez-Ramos M. d. M. et al.	CA 6.3	2020	Pesticide residues evaluation of organic crops. A critical appraisal.	Food Chemistry: X 5 (2020), Art. No. 100079	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Analytical method development and optimisation for detection of multiple pesticides in crops with low LOQ. Monitoring data from 136 commercial organic samples showed no residues of glyphosate, n-acetyl glyphosate, AMPA, n-acetyl-AMPA. Origin of samples not fully described. For method validation it is relied on published data.

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
20	Hao J. Y. et al.	CA 5.8.2	2020	Glyphosate-induced Delayed Pyloric Obstruction, Ulcer and Scar Changes.	Journal of the College of Physicians and Surgeons-Pakistan (2020), Vol. 30, No. 8, pp. 868-870	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper describes a case report of a 44-year-old woman who presented with pyloric obstruction two months after accidentally ingesting 100 mL of formulated glyphosate. After the initial ingestion, her family took her to the hospital where the patient was treated for 13 days and then discharged. She later returned to the hospital with recurrent nausea & vomiting, underwent endoscopy where they discovered scarring and pyloric obstruction. The patient underwent a partial gastrectomy and gastrojejunostomy with improvement of symptoms. This clinical course of events is not unexpected in significant ingestions of formulated glyphosate as these ingestions are corrosive and can cause scarring & gastric outlet obstruction.
61	Haponenko Y. Y. et al.	CP 7.1.7	2019	Zinc oxide nanoparticles enhance the hepatotoxic effects of glyphosate herbicide.	Medichna ta Klinichna Khimiya (2019), No. 4, pp. 32-36	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Article provides information about effects of glyphosate based herbicide on liver parameters of rats, but does not alter risk assessment. The product used in the study is not sufficiently identified, the test substance was identified only as 'Roundup'. The surfactant system in the formulated product used in this study was not confirmed by the author. It is therefore not possible to confirm whether the product used contained POEA or not. Furthermore, study procedure, test species and animal housing conditions are not adequately described.
31	Ingaramo P. et al.	CA 5.8.3	2020	Are glyphosate and glyphosate-based herbicides endocrine disruptors that alter female fertility?	Molecular and cellular endocrinology (2020), Vol. 518, Art. No. 110934	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The review article selectively reports results of in vitro and in vivo studies suggesting endocrine disrupting properties of glyphosate and glyphosate-based herbicides at low or "environmentally relevant" dose levels in the female reproductive tissue. Most of the studies focused on the endocrine-disrupting effects of glyphosate in endocrine-dependent tissues (ovary and uterus). The authors claim that most of these studies show effects at very low concentrations, which would be undetected in traditional toxicology studies. However, they did not adequately explain the design of the experiments, address potential confounders in the cited studies (e.g., overt and systemic toxicity, cytotoxicity) that impact the studies validity to inform an endocrine assessment, nor the reasons why the reported investigations can detect effects that the comprehensive database of regulatory toxicity studies for glyphosate were not able to ascertain. The most significant flaw with this review was the omission of numerous reliable and relevant published in vitro and in vivo studies, and publicly available regulatory assessments, that are critical to inform a weight of evidence assessment for glyphosate and GBHs. The missing information was largely included in the recent 2017 EFSA Glyphosate ED weight of evidence evaluation where it was concluded that glyphosate is not an endocrine disruptor. Figure 1 proposes mechanisms of endocrine disruption that include impact on aromatase activity, estrogenic effects through a ligand-independent mechanism,

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
						cell proliferation, and expression of oestrogen-dependent proteins. It was concluded in the recent 2015 USEPA and 2017 EFSA weight of evidence ED assessments that glyphosate does not impact steroidogenesis including aromatase activity. Findings in the articles cited in figure 1 for aromatase activity are confounded by non-specific effects of supraphysiological concentrations of the surfactant in these formulations in in vitro or in vivo systems. There is no evidence of glyphosate impacting aromatase expression or activity by assessing apical endpoints in the comprehensive toxicology database for glyphosate (for review see Levine et al. 2020). Figure 1 also purports that glyphosate is a ligand for the oestrogen receptor. It has been well established that glyphosate in not a ligand for the oestrogen receptor and does not transactivate the oestrogen responsive genes endpoints (for a comprehensive review of the oestrogen pathway see Levine et al. 2020). The paper cited in figure 1 to support a ligand-independent mechanism by Mesnage et al. 2017 was reported to only occur at the unrealistic exposure concentration of 20,000 mg glyphosate a.e./L (118 µm) and by activating protein kinase A that increases the phosphorylation and activation of the oestrogen receptor. Mesnage et al. did not provide evidence in their paper that the phosphorylation status of the oestrogen receptor was changed to support their hypothesis nor is this hypothesis consistent with the weight of evidence from validate functional assays. Figure 1 also proposes that glyphosate can cause cell proliferation through and endocrine mechanism. This hypothesis is inconsistent with results of the comprehensive database of glyphosate toxicology studies. The key citation that support this hypothesis is by Thongprakaisang et al. 2013. Mesnage et al. 2017 concluded the results in Thongprakaisang et al. 2013 likely result from contamination and not glyphosate. An earlier study that reported modest proliferation by glyphosate only occurred at the extremely high concentration of 1000 µM and the authors concluded that the modest proliferation observed in their study resulted from a non-endocrine mechanism (Lin and Garry, 2000). The final endocrine mechanism described in figure 1 refers to expression of oestrogen-dependent proteins. The significance of these findings is questionable based on the results of the endocrine screening battery reviewed by EFSA in 2017 and the comprehensive regulatory toxicology database for glyphosate. The authors, however, recognize that it was not possible to reproduce in vivo most of the effects of glyphosate and/or GBHs observed in vitro. They claim this could be due that the species tested are not the appropriate ones and claimed that the sheep constitute a highly appropriate model to evaluate the effects of EDCs due to the similarity between sheep and humans, especially regarding gestational and thyroid physiologies and brain ontogeny. However, robust data supporting this assumption are limited.
59	Jang S. J. et al.	CA 8.6.2, CP 10.6.2	2020	Inhibition of wheat growth planted after glyphosate application to weeds.	Weed Science (2020), Vol. 68, No. 4, pp. 373-381	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: No endpoints are provided, the study does not alter risk assessment but the findings of the work could serve to support the lack of effects of glyphosate fresh and aged residues (0, 1, 3, 5, and 7 days)

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
						after sowing wheat seeds in soils previously treated with glyphosate at 600 g ae/ha as part of a broader discussion. The formulation tested contains an ammonium salt, which has a substantially higher loading than the AIR5 representative formulation MON 52276 that contain isopropylammonium salt. The tested formulation is not fully identified. No analytical verifications of the test concentration in soil were conducted. OECD TG 208 was not followed and therefore validity criteria cannot be assessed. No emergence was investigated, only growth. No ECx assessment was conducted. The number of tested individuals is insufficient.
44	Khan N. et al.	CA 6.3	2020	Assessment of Health Risk due to Pesticide Residues in Fruits, Vegetables, Soil, and Water.	Journal of Chemistry (2020), Vol. 2020, Art. No. 5497952	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, does not alter risk assessment. Fruit, vegetable, soil and water samples from Pakistan were analysed for glyphosate residues (monitoring), with detects in fruits and vegetables. Missing validation data, analytical method and origin of samples not sufficiently described.
21	Kimura T. et al.	CA 5.8.2	2020	Renal tubular injury by glyphosate-based herbicide.	Clinical and experimental nephrology (2020), Vol. 24, No. 12, pp. 1186	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This is a case report with an image showing proximal tubular epithelial injury in a 78-year-old woman who ingested formulated glyphosate in a suicide attempt. This ingestion resulted in transient renal failure which improved with hemodialysis. This in not unexpected in large suicidal ingestions.
55	Lacava M. et al.	CA 8.3.2, CP 10.3.2.2	2021	The pest-specific effects of glyphosate on functional response of a wolf spider.	Chemosphere (2021), Vol. 262, Art. No. 127785	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: No endpoints are provided, the study does not alter risk assessment but the findings of the work could serve to support the sub-lethal effects (on the feeding rate) of glyphosate on a ground-dwelling spider as part of a broader discussion. The test substance was identified only as 'Roundup'. The surfactant system in the formulated product used in this study was not confirmed by the author. It is therefore not possible to confirm whether the product used contained POEA or not. The tested individuals were collected from native forests from Uruguay and previous pesticide exposure cannot be excluded. The tested substance has not been fully identified. A tested rate is not provided (just that a glyphosate solution with a concentration of 280 mg/L a.i. was used). Tested individuals were exposed by contact for only 30 minutes. The experiment run in glass containers only for 4 hours, so only acute effects were assessed. Only one concentration was tested. The outcome of the study not only depends on the effects of glyphosate, but also on the tested prey (different results depending on the prey). The test is not conducted according to any guidance and therefore, it is not possible to confirm whether the study meets any validity criteria.
32	Levine S. L. et al.	CA 5.8.3	2020	Review and analysis of the potential for glyphosate to interact with the estrogen, androgen and thyroid pathways. Special Issue: Glyphosate exposure and	Pest Management Science (2020), Vol. 76, No. 9, pp. 2886-2906	The article has been classified as relevant by full text - Category B for the following reason: The article is a review article providing a good summary and also further analysis on possible endocrine disrupting properties of glyphosate in USEPAs endocrine disruptor screening program (EDSP) and further literature but does not alter risk assessment.

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				toxicology.		
13	Lorenz V. et al.	CA 5.6, CA 5.8.3	2020	Perinatal exposure to glyphosate or a glyphosate-based formulation disrupts hormonal and uterine milieu during the receptive state in rats.	Food and chemical toxicology (2020), Vol. 143, Art. No. 111560	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The article is not reliable for the following reason: The study does not follow any OECD testing guideline, therefore the experimental design and procedures should be not only explained but validated against appropriate reference substances and the interpretation of the results should be supported by adequate historical control data that allow the correct interpretation of the relevance of a change. This is particularly true when assessing the biological relevance of hormonal changes and/or the assessed gene expression. In this publication such data are not provided. It is not clear why only 9 F1 females/group were selected to assess the effects on the pre-implantation phase and not a higher number to cover the basal hormonal variations observed, which should be high based on the scattered values observed in the control group of this study. The authrors claim that there was an imbalance in the serum levels of estradiol 2 in relation to progesterone, but the progesterone values were apparently not impacted. Similarly, they claim that glyphosate induced significantly the ERα expression at protein level subepithelial stroma of the uteri (which was not observed in other parts of the uterus), although no changes were observed in ERα mRNA expression but do not take into consideration the inconsistency of their results. Similarly, they concluded that glyphosate provoked aberrant expression on implantation-genes although a consistent response was not observed among all the tested genes. The reproductive performance data of F1 females is not reported in a transparent way: only selected photos of the uterus are presented to indicate that there was a decrease in the number of implantation sites. However, the actual number of the implantation sites per animals are not reported. Similarly the number of corpora lutea, resorption sites and preimplantation loss are represented in graphics (figure 2A, B and C), but the actual number have not been given. So, the authors do not provide the reader of an objective information to understand whether an effect did occur. Overall, this publication presents several deficiencies and bias in reporting the results of their investigations and as such is considered to be not reliable.
45	Lozowicka B. et al.	CA 6.3	2019	Pesticide residues in seeds of winter oilseed rape (Brassica napus L.).	Progress in Plant Protection (2019), Vol. 59, No. 4, pp. 199-205	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Monitoring data from OSR samples collected in Poland during 2016-2019. Glyphosate residues found in 14% of samples (max 0.27 mg/kg). Analytical method not fully described, origin of samples not fully described.
17	Masood M. I. et al.	CA 5.7	2020	Environment permissible concentrations of glyphosate in drinking water can influence the fate of neural stem cells from the subventricular zone of the	Environmental pollution (2020), Vol. 270, Art. No. 116179	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on neurotoxicty (in vitro experiment), but does not alter risk assessment. The reporting on the test material is limited. Ca2+ uptake was investigated at too high concentrations not relevant for assessment (> 1mM), but the remaining endpoints were investigated at suitable concentrations (< 1

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				postnatal mouse.		mM). No positive or negative controls were included and historical control data were not provided.
14	Milesi M. M. et al.	CA 5.6.1	2020	Correction to: Response to comments on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats (Correction to Archives of Toxicology (2019) 93:3635–3638).	Archives of Toxicology (2020), Vol. 94, No. 8, pp. 2897–2898	The article has been classified as relevant by full text - Category B for the following reason: This is a serie of comments and corrections connected to the article by Milesi et al. (*Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2018), Vol. 92, No. 8, pp. 2629-2643*). This article was evaluated in the previous search and classified as relevant by full text - Category B. In order to reflect the category of the main article, the correction was also classified as Category B. The correction corrects Table 1 of the publication, which lists factors associated with the pre-implantation loss rate and factors associated with feto-placental parameters of F2 offspring in control and glyphosate-based herbicede-treated female rats. The serie contains e.g. following articles, comments and corrections: Milesi et al., Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2018);92(8):2629-2643. Plewis, Comment on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2019);93(1):207. Milesi et al., Response to comments on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2019);93(12):3635-3638. Paumgartten, Comment on Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats, Arch Toxicol 92:2629-2643 : On the impairment of female reproductive performance by developmental exposure to a glyphosate-based herbicide. Arch Toxicol. (2019);93(3):831-832. Plewis, Comment on response from Milesi et al. to Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2020);94(1):351-352. Milesi et al., Correction to: Response to comments on: Perinatal exposure to a glyphosate-based herbicide impairs female reproductive outcomes and induces second-generation adverse effects in Wistar rats. Arch Toxicol. (2020);94(8):2897-2898.
51	Motta E. V. S. et al.	CA 8.3.1.1.2, CA 8.3.1.4, CP 10.3.1.1.2, CP 10.3.1.4, CP 10.3.1.6	2020	Oral or Topical Exposure to Glyphosate in Herbicide Formulation Impacts the Gut Microbiota and Survival Rates of Honey Bees.	Applied and environmental microbiology (2020), Vol. 86, No. 18	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: No proper endpoints are provided (only acute toxicity at 24h). The study does not alter risk assessment, but the findings of the work could serve to support the acute contact toxicity to bees and further sub-lethal effects of glyphosate (mortality) on honey bees as part of a broader discussion. Both laboratory and field experiments were conducted. The study is

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						focused on the effects of glyphosate on bee gut microbiota. The glyphosate standard tested item is not fully described. No analytical verifications of the test item concentrations in the medium were conducted. Study is not compliant with any accepted guideline and therefore validity criteria cannot be assessed. Glyphosate was tested topically at different concentrations and only EC50 assessment (at 24 h instead of at 48 h as recommended by the guidance) was performed. A dose-response effect was observed in several parameters studied (not only mortality). For the field experiments, there is no security that the bees haven't been exposed to pesticides before the tests started. Findings cannot be related directly to impacts at the population level therefore influence on direct level and indirect assessment is uncertain. Nor is this a study type driven by data requirements. In additon, the tested formulation is not related to the representative formulation for the AIR5 (MON 52276).
33	Munoz J. P. et al.	CA 5.8.3	2020	Glyphosate and the key characteristics of an endocrine disruptor: A review.	Chemosphere (2020): Ahead of print. doi.org/10.1016/j.chemosphere.2020.128619	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. Munoz et al. based on the ten key characteristics (KC) of Endocrine Disrupting Chemicals (EDCs) recently proposed (La Merrill et al., 2020) reviewed a selective set of publications related to glyphosate as a possible endocrine disruptor. The authors claim that glyphosate exhibited eight of the ten KCs of an EDC. This checklist of KC was not created in conjunction with nor is it recognised by any regulatory agency as a replacement for established weight of evidence approaches used by regulatory agencies to assess whether a compound is an endocrine disruptor. The authors did not perform a systematic review for glyphosate of the publicly available information resulting in a significant flaw with this publication, the omission of numerous reliable and relevant published in vitro and in vivo studies, and publicly available regulatory assessments, that are critical to inform a weight of evidence assessment for glyphosate. Glyphosate has undergone extensive regulatory testing and assessment to evaluate its potential to be an endocrine disruptor. In 2015 the US EPA released its weight of evidence evaluation of glyphosate and more recently the European Food Safety Authority in 2017, who independently performed an endocrine assessment as part the of the glyphosate renewal process. Both agencies concluded based on the US EPA EDSP battery and all other scientifically relevant information that glyphosate does not interact with the oestrogen, androgen thyroid and steroidogenic pathways and concluded that glyphosate is not an endocrine disruptor. Furthermore, the cited studies in Munoz et al. 2020 were not critically evaluated for relevance and reliability nor evaluated with a weight of evidence to conclude whether the criteria for each key characteristic was met. The authors state “Here, we conduct a comprehensive review where we describe the most important findings of the glyphosate effects in the endocrine system and assess the mechanistic evidence to classify it as and EDC”. However, many of the studies the authors cite as evidence for glyphosate meeting one of the KC they used studies that were conducted with a glyphosate-based formulation only. The

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						authors generally focused on a small subset of papers that used non-standard in vitro methods that tested glyphosate-based formulations at unrealistically high levels and in vivo studies that don't follow international guidelines. These papers inflate the relevance of findings derived from their in vitro models to the in vivo situation and invariably fail to discuss or recognize confounding effects of the formulation. As a result, these papers are not considered to be reliable for an endocrine assessment.
22	Nayak S. et al.	CA 5.8.2	2020	Deliberate self-poisoning in south odisha: study of its clinical profile and outcome.	Asian Journal of Pharmaceutical and Clinical Research (2020), Vol. 13, No. 8, pp. 169-173	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper aimed to characterize the nature of self-poisoning in the Odisha region of India. Over a 2-year period they evaluated 200 patients who presented to the Maharaja Krishna Medical College and found that 149 (74.5%) patients had ingested pesticides. 10 patients ingested glyphosate. 9 developed nausea & vomiting, 2 developed corrosive injury to their GI tracts, 2 had pneumonitis likely due to aspiration, 2 developed hypotension, 2 had altered mental status, 2 developed dysrhythmias, 3 had dysphagia, 3 had dehydration & 2 died. There was certainly overlap in the clinical picture as there are more symptoms described than patients. The symptoms described are not unexpected as large ingestions of formulated glyphosate causes corrosive injury to the GI tract and subsequent hypotension & multiorgan failure.
40	Panseri S. et al.	CA 6.10.1	2020	Pesticides and Environmental Contaminants in Organic Honeys According to Their Different Productive Areas toward Food Safety Protection.	Foods (2020), Vol. 9, No. 12	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Monitoring data from organic honey samples (n = 98) collected in Italy (Apulia) during 2019-2020. Residues of glyphosate, AMPA and glufosinate were not found in any sample. References are provided to validation of analytical methods. Source of honey samples are not exactly described.
41	Petcu C. D. et al.	CA 6.10.1	2020	Study regarding the honey contamination degree assessed in a specialized production unit.	Scientific Papers, Series D. Animal Science (2020), Vol. 63, No. 1, pp. 442-449	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Supplementary information only, not altering risk assessment. Samples from "honey sourced from beekeepers from the centre and Southern Romania (in order to form a large and homogeneous batch)" were analysed. Analysis done by LC-MS/MS with poor method description and no validation data. Residues of glyphosate were below the limit of quantification (<0.01 mg/kg) in 15 acacia and 15 polyfloral honey samples.
15	Refaie A. A. et al.	CA 5.6.2	2020	DNA and liver damage induced by glyphosate herbicide in suckling pups of wistar rat.	Current Topics in Toxicology (2020), Vol. 16, pp. 205-214	The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability**. The article is not reliable for the following reason: Storage conditions of test item not reported. Animal strain not further specified and age of dams not reported. No analysis of test item in solvent performed. Insufficient number of animals/group tested. It should be noted that the experimental unit for such an experimental design is the litter, not the individual pups. Therefore, statistical evaluations should have been conducted to compare across litters, where n = 2, affording only one degree of freedom for statistical comparisons.
23	Ren Y. et al.	CA 5.8.2	2020	Case report of pyloric obstruction caused by	Acta Medica Mediterranea (2020), Vol. 36, No. 6, pp.	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This

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				glyphosate herbicides.	3485-3488	paper is a case series describing 3 patients with formulated glyphosate ingestions. The authors describe pyloric obstruction and laryngeal scarring in the patients. Formulated glyphosate is caustic to the GI tract and airways so this clinical scenario is not unexpected.
56	Sekrecka M.	CA 8.3.2.2, CP 10.3.2.2	2019	Influence of pesticides and bioregulators on the number of predatory mite Typhlodromus pyri (Phytoseiidae). Original title: Wplyw srodkow ochrony roslin oraz bioregulatorow na liczebnosc drapieznego roztocza dobroczynka gruszowca Typhlodromus pyri (Phytoseiidae).	Zeszyty Naukowe Instytutu Ogrodnictwa (2019), Vol. 27, pp. 41-52	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides information on the mortality of T. pyri mites 7 days after exposure but no risk assessment relevant endpoint can be obtained from the study. The study does not alter risk assessment. The test item is not fully described. The tested dose in g a.s./ha is not clear. Source of the tested individuals not fully reported (conditions of the lab mass rearing). The test design and the developmental phase of the tested individuals are not relatable to EU risk assessment (apple slices sprayed using a potter tower and then after drying, animals introduced). No agreed guidance has been followed (Bluemel et al., 2000).
24	Shin J. et al.	CA 5.8.2	2020	Severe chemical burns related to dermal exposure to herbicide containing glyphosate and glufosinate with surfactant in Korea.	Annals of occupational and environmental medicine (2020), Vol. 32, Art. No. E28	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This article is a case report detailing an injury sustained by a farmer who was reportedly spraying a glyphosate/glufosinate herbicide formulation, spilled the contents of his back pack on his right shoulder & hip, did not wash the formulation off and presented 3 days after with rapidly progressive necrotizing wounds that have a necrotizing fasciitis appearance in the photos. Unfortunately, the patient succumbed to his injuries. These herbicides are not corrosive to the skin in this fashion, it is impossible to tell what the farmer was exposed to in this scenario as infectious processes can result in a very similar clinical appearance. This is completely atypical and should not be associated with glyphosate exposure.
11	Skanes B. et al.	CA 5.4, CA 5.5, CA 5.6	2021	Hazard assessment using an in-silico toxicity assessment of the transformation products of boscalid, pyraclostrobin, fenbuconazole and glyphosate generated by exposure to an advanced oxidative process.	Toxicology in vitro : an international journal published in association with BIBRA (2021), Vol. 70, Art. No. 105049	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: Article provides only supplementary information on in silico evaluation of genotoxicity, acute oral toxicity or carcinogenicity but not altering risk assessment. Only one type of software was used for each endpoint. Toxtree was used to address Cramer classification, Ames test, carcinogenicity / mutagenicity, DNA binding and micronucleus assay. Toxicity estimation software tool (TEST) was used to address developmental toxicity and the rat oral LD50. The toxicity evaluation based on single software was considered not robust enough.
47	Solomon K. R.	CA 6.9	2020	Estimated exposure to glyphosate in humans via environmental, occupational, and dietary pathways: an updated review of the scientific literature. Special Issue: Glyphosate exposure and toxicology.	Pest Management Science (2020), Vol. 76, No. 9, pp. 2878-2885	The article has been classified as relevant by full text - Category B and reliable without restrictions for the following reason: The article provides only supplemental information, which does not alter risk assessment. No endpoint was derived. Extended risk assessment using published exposure data for air, water, bystanders, the general public, domesticated animals, pets, and applicators. Based on this large dataset, no risk to any exposure pathway/group was identified. The article is reliable with respect to risk assessment methodologies applied, i.e. well described methodologies and data set for analysis.

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38	Spinaci M. et al.	CA 5.8.3, CP 7.1.7	2020	Glyphosate and its formulation Roundup impair pig oocyte maturation.	Scientific reports (2020), Vol. 10, No. 1, Art. No. 12007	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The article provides only supplementary information on maturation, steroidogenesis and oxidative stress markers of cumulus-oocyte complexes (COCs) from pigs, but not altering risk assessment. In addition, effects were mainly found at unphysiologically high doses (> 1 mM). The purity and storage conditions of the test item were not reported. No cytotoxicity testing performed, no positive and truly negative controls performed and also no historical control data provided. No metabolic activation system applied.
25	Stajnko A. et al.	CA 5.8.2	2020	Seasonal glyphosate and AMPA levels in urine of children and adolescents living in rural regions of Northeastern Slovenia.	Environment international (2020), Vol. 143, Art. No. 105985	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper aimed to measure glyphosate and AMPA exposure in children & adolescents in Slovenian agricultural areas. They measured 1st morning urines in the 246 participants in the winter and again in 225 participants in the summer. They addressed the fact that the detection of AMPA could come from other detergent exposures and not from glyphosate alone. 221 blood samples were also drawn in the first sampling period. They detected glyphosate in 27% of the urine samples from the winter and 22% in the summer. Their data demonstrate much lower glyphosate concentrations than reported in other parts of the world. A large percentage of the children had concentrations less than the LOQ with 72% of the younger children & 74% of the older children testing below the LOQ in the first sampling period, and 79% of the younger & 76 % of the older testing below the LOQ in the 2nd period. The estimated systemic dose of glyphosate was 0.003 mcg/kg of body weight – significantly below the ADI of 0.1 mg/kg of body weight. This article supports the evidence that glyphosate exposures tend to be very low and don't pose a health risk.
53	Strobl V. et al.	CA 8.3.1.2, CP 10.3.1.2	2020	Positive Correlation between Pesticide Consumption and Longevity in Solitary Bees: Are We Overlooking Fitness Trade-Offs?	Insects (2020), Vol. 11, No. 11, Art. No. 819	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: Provides information on the survival of solitary bees after chronic exposure to glyphosate (at 1 single concentrations after 10 days continuous oral exposure) but no risk assessment relevant endpoints are given. The study does not alter exisiting risk assessment. Although the Osmia bicornis tested adults were obtained from cocoons reared in the laboratory, original individuals were transferred from organic orchards in Germany and previous pesticide exposure cannot be totally excluded. Measured parameters are not clearly described and there seems to be an error/typo in the glyphosate dose at which the bees were exposed. Sucrose solution consumption was recorded but no analytical verifications of the test item concentrations in the medium were conducted. No guidance document is available yet for lab studies with solitary bees. No ECx assessment was conducted for any of the parameters studied.
50	Tajnaiova L. et al.	CA 8.2.6.1, CA 8.2.7, CP 10.2.1	2020	Determination of the Ecotoxicity of Herbicides Roundup (R) Classic Pro and Garlon New in Aquatic and Terrestrial Environments.	Plants-Basel (2020), Vol. 9, No. 9, Article No. 1203	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: This study investigates the effect of Roundup® Classic Pro (not relevant for the AIR5, as it contains the additive surfactant ether alkylamine ethoxylate) and AMPA on the aquatic organisms duckweed Lemna minor and green algae Desmodesmus subspicatus and on the

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
						enzymatic activity of soil. The endpoints for AMPA do not alter risk assessment but are supportive of low exposure risk (relevant growth inhibition endpoints obtained for both green algae and macrophytes: Desmodesmus subspicatus (green alga): 72 h AMPA IC50 = 117.8 mg/L; 72 h AMPA IC50 with pH adjusted solution = 192.1 mg/L). No analytical verifications of the test item concentrations in the medium were conducted. The experimental design was carried out according to the following standards: EN ISO 8692 (Water Quality-Fresh Water Algal Growth Inhibition Test with Unicellular Green Algae (ISO 8692:2012)) and EN ISO 20079 (Water Quality-Determination of the Toxic Effect of Water Constituents and Waste Water on Duckweed (Lemna minor)-Duckweed Growth Inhibition Test (ISO 20079:2005)). Only the IC50 assessment was performed. There is no analytical to confirm exposure. Results are also ambiguous in that % inhibition plots are presented but data presented is unknown (rate or biomass or cell density?).
6	Tauchnitz N. et al.	CA 7.1.3, CA 7.1.1.2	2020	Assessment of pesticide inputs into surface waters by agricultural and urban sources - A case study in the Querne/Weida catchment, central Germany.	Environmental pollution (2020), Vol. 267, Art. No. 115186	The article describes pesticide analyses, amongst them glyphosate, in surface waters and in soil samples within a German catchment area (CA 7.5). Additionally, batch adsorption (CA 7.1.3) and anaerobic soil degradation experiments (CA 7.1.1.2) were conducted. For CA 7.5, the article has been classified as relevant by full text - Category A and reliable without restrictions: A detailed summary for CA 7.5 is provided. Please refer to Tables 32 and 33 above. For CA 7.1.1.2 and CA 7.1.2, see below. The article has been classified as relevant by full text and **downgraded to Category B due to its non-reliability** for CA 7.1.1.2 and CA 7.1.3 for the following reason: CA 7.1.1.2: For the anaerobic degradation experiment, the methods are well described, however the experimental design is not in agreement with the relevant guideline (OECD 307), e.g. due to use of synthetic rainwater, insufficient information on the test concentrations, use of slurry of a liquid-solid ratio of 0.3:1, air-tight incubation and analysis of pore water, only. From the information provided, it cannot be concluded on the representativeness of the soils used. Further, besides the final half-live, no detailed results are reported. Thus, no conclusion can be made on the quality of the results. The results from the anaerobic degradation experiment are therefore considered **not reliable**. CA 7.1.3: For the batch adsorption experiment, the methods are well described, however the experimental design is not in agreement with the relevant guideline (OECD 106), e.g. due to use of synthetic rainwater instead of CaCl2 solution, insufficient information on the test concentrations and a temperature of 10 °C. From the information provided, it cannot be concluded on the representativeness of the soils used. Further, besides the final adsorption parameters, no detailed results are reported. Thus, no conclusion can be made on the quality of the results. The adsorption results are therefore considered **not reliable**.
46	Tittlemier	CA 6.5.3	2020	Fate of glyphosate in wheat	Cereal Chemistry (2020):	The article has been classified relevant by full text - Category B and reliable with

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
	S. A. et al.			during milling and bread production.	Ahead of Print DOI: 10.1002/cche.10369	restrictions for the following reason: Supplementary information only. No endpoint is derived. The study does not alter risk assessment. This study is considered supportive for processing of wheat, however no clear processing factors can be derived. Absence of validation data in different processed wheat matrices. For the analytical method it is referred to another publication (Tittlemier et al., 2017).
62	Tizhe E. V. et al.	CP 7.1.7	2020	Effect of zinc supplementation on chronic hepatorenal toxicity following oral exposure to glyphosate-based herbicide (Bushfire®) in rats.	The Journal of international medical research (2020), Vol. 48, No. 8, pp. 1-15	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: The publication investigates whether zinc supplementation can improve toxicity caused by glyphosate. No new information on glyphosate toxicity itself is provided and the article does not alter risk assessment. Many important basic paramaters which are standard in the conduct and reporting of toxicology studies are absent; food consumption, body weight, body weight gain, clinical signs, diarrhea, etc. In addition, gavage of a surfactant containing mixture for 36 weeks would likely result in gastrointestinal effects, such are ulcers in the forestomach of rats, and necropsies were not performed to evaluate this significant consequence of repeated gavaging of surfactant. With the absence of recorded liver weights, potential adaptive responses of increased circulating enzymes are not able to be put into context. Therefore, no context of the clinical chemistry findings can be understood.
34	Toth G. et al.	CA 5.8.3	2020	Cytotoxicity and hormonal activity of glyphosate-based herbicides.	Environmental pollution (2020), Vol. 265, No. Pt B, Art. No. 115027	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: This article provides only supplementary information for risk assessment, since the in vitro experiments were performed with yeast instead of human cells. Nevertheless, the findings showed, that neither glyphosate nor AMPA impaired estrogenic or androgenic activity in the test system. Purity and storage conditions of test items and historical control data not reported. Positive controls applied, but data not shown. This study claims that POEA and some glyphosate-based formulations are estrogenic and/or androgenic. However, the study does not provide reliable information that POEA or any of the tested formulations are estrogenic and/or androgenic. The results claiming estrogenicity and/or androgenicity of the formulations are not in agreement with what would be predicted based on chemical structures of the surfactants and are apparently confounded by cytotoxicity based on responses presented within the paper. Because of the surface-active properties (i.e. surfactant properties) of POEA and other surfactants, it is very difficult to generate interpretable results from in vitro or cell-based assays, like the yeast assay, with surfactants. Rather, conclusions of estrogenicity and androgenicity should be based on in vivo studies. Even if the activity levels claiming estrogenic or androgenic activity are taken at face value, their potency for the estrogen and androgen receptors is so low these responses are not considered biologically relevant and realistic exposures to these substances are far below reported effect levels in the paper.
26	Xiao L. et al.	CA 5.8.2	2021	A 9-year retrospective study of poisoning-related deaths in Southwest China (Sichuan).	Forensic Science International (2021): Ahead of Print	The article has been classified as relevant by full text - Category B for the following reason: Medical data not altering the existing risk assessment. This paper describes retrospective study evaluating 782 poisoning deaths in Sichuan

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
					10.1016/j.forsciint.2020.110558	Province, China. The deaths were characterized as accidental, suicidal or homicidal. Pesticide ingestion was responsible for 40% of deaths. Only 2 deaths were related to glyphosate formulations and no details were given about the cases.
42	Yaqub G. et al.	CA 6.10.1	2020	Monitoring and risk assessment due to presence of metals and pesticides residues in honey samples from the major honey producing forest belts and different brands.	Food Science and Technology (2020), Vol. 40, No. Suppl. 1, pp. 331-335	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: 25 samples of different national (Pakistan) and international honey brands were collected for analysis of residues of heavy metals and pesticides. Glyphosate residues were detected in 5 samples in a range of 0.44 - 3.5 mg/kg (ppm). The residue levels found in the analysed samples are not directly relevant to the EU uses supported in the AIR dossier. However, the data may be useful to interpret the results of the EU monitoring data for glyphosate residues in honey. Therefore, they are considered as category B (supplementary information). The publication is reliable, but with several restrictions, i.e. missing validation data, analytical method and origin of samples are not sufficiently described.
35	Zhang C. et al.	CA 5.8.3	2020	Molecular Basis for Endocrine Disruption by Pesticides Targeting Aromatase and Estrogen Receptor.	International journal of environmental research and public health (2020), Vol. 17, No. 16, Art. No. 5664	The article has been classified as relevant by full text - Category B and **not reliable** for the following reason: The article provides only supplementary information on in vitro data and binding information gained by in silico models but not altering risk assessment. Limited information on test material (batch, analytical purity) provided. Historical control data were not included. The reported inhibition of aromatase activity (up to 30% at 100 µM glyphosate acid) is likely related to using ethanol or DMSO as a solvent for glyphosate, rather than water or buffer. Glyphosate is not soluble in an organic solvent, like ethanol or DMSO, and this likely confounded the results of the assay because glyphosate was not fully solubilized. Zhang et al. used recombinant CYP19 at low protein levels in the assay and did not add a "buffering protein" like BSA, which made the aromatase enzyme, and its associated reductase, susceptible to denaturization. Consistent with denaturing the aromatase enzyme, the slope of the inhibition curve was extremely shallow, uncharacteristic of aromatase inhibition, and likely reflects confounding effects of undissolved test substance. In the USEPA's test guideline for aromatase activity, activity of < 25% is considered negative and activity between 25% and < 50% is considered equivocal. Greater than 50% inhibition must be estimated for a substance to be considered positive in EPA's guideline study.
36	Zhang J. et al.	CA 5.8.3	2021	Melatonin alleviates the deterioration of oocytes and hormonal disorders from mice subjected to glyphosate.	Molecular and cellular endocrinology (2021), Vol. 520, Art. No. 111073	The article has been classified as relevant by full text - Category B and reliable with restrictions for the following reason: The publication investigates whether melatonin can improve reproductive defects caused by glyphosate. No new information on glyphosate toxicity is provided and the article does not alter risk assessment. There is a limited information on test material provided (no information on source, batch or purity), limited information on test animals (no information on housing, environmental conditions or weight), no historical control data provided.

Table 36: Articles of unclear relevance (category C) after detailed assessment: sorted by data requirement(s)

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
63	CA 5.9.4	Intayoung U. et al.	2020	Effect of Occupational Exposure to Herbicides on Oxidative Stress in Sprayers.	Safety and Health at Work (2020): Ahead of print. doi.org/10.1016/j.shaw.2020.09.011	The relevance of this article is unclear (Category C) for the following reason: The underlying rationale for this study was that an increase in the urinary MDA level after a pesticide application would be indicative of a toxic effect of pesticides with potential future health consequences. In order to assess MDA levels related to an application, the authors used the collection and analysis of spot urine samples before and after a workday that involved application of either glyphosate alone (n = 52 or 56.0%), glyphosate and paraquat (n = 7 or 7.5%), or glyphosate and 2,4-D (n = 34, 36.5%). In essence, the authors were using a self-controlled pre/post study design with individuals acting as their own controls. The average difference between pre-application and post-application MDA values within the same individuals would serve as the basis for judging the impact of the on-study pesticide applications. The self-controlled results for workers in the 3 pesticide categories did not show a significant change in pre versus post workday MDA urinary levels. Therefore, one should conclude from those results that the pesticide applications did not increase MDA levels. Instead, the authors deviated from the self-controlled results and compared post work MDA levels for those who applied glyphosate and paraquat versus those who applied glyphosate alone. There is no pre-application baseline for this comparison and pre-application levels for these two groups differed appreciably (see Table 1). The post-workday comparison is not an evaluation of the on-study work and its effect on MDA levels. It should not be interpreted to conclude that the post-work difference in MDA levels across exposure categories indicates a joint effect of glyphosate and paraquat from the on-study applications. The comparison of relevance to the study's rationale is the self-controlled pre-work versus post-work comparison within pesticide classes. Other results showed that the (putatively protective) antioxidant enzyme GSH was not reduced for workers in any of the 3 pesticide categories. To conclude, this study did not show that glyphosate increases reactive oxygen species for pesticide workers or decreases potentially protective GSH levels. The relevance of these results for assessing glyphosate risk is uncertain.

Submission Number	Data requirement (indicated by the corresponding CA / CP data point number)	Author(s)	Year	Title	Source	Justification
64	CA 8.3.1.2, CP 10.3.1.2	Motta E. V. S. et al.	2020	Impact of glyphosate on the honey bee gut microbiota: effects of intensity, duration, and timing of exposure.	mSystems (2020), Vol. 5, No. 4, pp. E00268-20	The relevance of this article is unclear (Category C) for the following reason: No endpoints are provided. Although this publication provides information about chronic impacts of glyphosate on bacteria that may be relevant at some level, it is uncertain without further guidance, how these data can be related to the EU level regulatory risk assessment (as the methods used are unrecognised) and how to interpret the data within the context of a renewal. Due to these uncertainties it has to be considered Category C with the uncertainties being the restrictions. The glyphosate formulation is not fully described. No analytical verifications of the test item concentrations in the medium were conducted. Study is not compliant with any accepted guideline and therefore validity criteria cannot be assessed. Although glyphosate was tested at different concentrations and a dose-response effect was observed in several parameters studied, no ECx assessment was performed.

Table 37: Articles of unclear relevance (category C) after detailed assessment: sorted by author(s)

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
63	Intayoung U. et al.	CA 5.9.4	2020	Effect of Occupational Exposure to Herbicides on Oxidative Stress in Sprayers.	Safety and Health at Work (2020): Ahead of print. doi.org/10.1016/j.shaw.2020.09.011	The relevance of this article is unclear (Category C) for the following reason: The underlying rationale for this study was that an increase in the urinary MDA level after a pesticide application would be indicative of a toxic effect of pesticides with potential future health consequences. In order to assess MDA levels related to an application, the authors used the collection and analysis of spot urine samples before and after a workday that involved application of either glyphosate alone (n = 52 or 56.0%), glyphosate and paraquat (n = 7 or 7.5%), or glyphosate and 2,4-D (n = 34, 36.5%). In essence, the authors were using a self-controlled pre/post study design with individuals acting as their own controls. The average difference between pre-application and post-application MDA values within the same individuals would serve as the basis for judging the impact of the on-study pesticide applications. The self-controlled results for workers in the 3 pesticide categories did not show a significant change in pre versus post workday MDA urinary levels. Therefore, one should conclude from those results that the pesticide applications did not increase MDA levels. Instead, the authors deviated from the self-controlled results and compared post work MDA levels for those who applied glyphosate and paraquat versus those who applied glyphosate alone. There is no pre-application baseline for this comparison and pre-application levels for these two groups differed appreciably (see Table 1). The post-workday comparison is not an evaluation of the on-study work and its effect on MDA levels. It should not be interpreted to conclude that the post-work difference in MDA levels across exposure categories indicates a joint effect of glyphosate and paraquat from the on-study applications. The comparison of relevance to the study's rationale is the self-controlled pre-work versus post-work comparison within pesticide classes. Other results showed that the (putatively protective) antioxidant enzyme GSH was not reduced for workers in any of the 3 pesticide categories. To conclude, this study did not show that glyphosate increases reactive oxygen species for pesticide workers or decreases potentially protective GSH levels. The relevance of these results for assessing glyphosate risk is uncertain.

Submission Number	Author(s)	Data requirement (indicated by the corresponding CA / CP data point number)	Year	Title	Source	Justification
64	CA 8.3.1.2, CP 10.3.1.2	Motta E. V. S. et al.	2020	Impact of glyphosate on the honey bee gut microbiota: effects of intensity, duration, and timing of exposure.	mSystems (2020), Vol. 5, No. 4, pp. E00268-20	The relevance of this article is unclear (Category C) for the following reason: No endpoints are provided. Although this publication provides information about chronic impacts of glyphosate on bacteria that may be relevant at some level, it is uncertain without further guidance, how these data can be related to the EU level regulatory risk assessment (as the methods used are unrecognised) and how to interpret the data within the context of a renewal. Due to these uncertainties it has to be considered Category C with the uncertainties being the restrictions. The glyphosate formulation is not fully described. No analytical verifications of the test item concentrations in the medium were conducted. Study is not compliant with any accepted guideline and therefore validity criteria cannot be assessed. Although glyphosate was tested at different concentrations and a dose-response effect was observed in several parameters studied, no ECx assessment was performed.

Table 38: Articles excluded after detailed assessment (i.e. not relevant): sorted by technical section (and by author)

Submission Number	Technical section	Author(s)	Year	Title	Source	Reason for not including publication in dossier (based on relevance and reliability criteria)
65	Ecotoxicology	Chaves A. et al.	2020	Effects of glyphosate-based herbicide on royal jelly production of Apis mellifera (Hymenoptera: Apidae) in field conditions.	JOURNAL OF APICULTURAL RESEARCH (2020): Ahead of print doi.org/10.1080/00218839.2020.1844463	The article has been classified as not relevant by full text for the following reason: This poorly described field study with honey bees was conducted in Brazil and therefore, does not deal with EU representative uses/conditions. In addition, the test item was not clearly identified, the test item purity is not stated, and the focus (royal jelly production) and design (hives without queens, for example) of the study are not relevant for the European regulatory purposes. The test substance was identified only as 'Roundup'. The surfactant system in the formulated product used in this study was not confirmed by the author. For studies conducted in Brazil, Roundup Original is occasionally used which contains POEA and is therefore not relevant to the EU as POEA is banned in the EU.
66	Ecotoxicology	de Carvalho Cruz R. et al.	2020	Glyphosate-based herbicide toxicophenomics in marine diatoms: impacts on primary production and physiological fitness.	Applied Sciences (2020), Vol. 10, No. 21, Art. No. 7391	The article has been classified as not relevant by full text for the following reason: The test design used does not reflect recognised approaches for EU level regulatory risk assessment. Furtheromore, test substance concentrations in the medium were not analytically determined. All validity criteria according to OECD TG 201 cannot be evaluated. Growth rate was determined at 48h (instead of 72h). The growth medium and the exposure phase are not clearly described. In addition, a glyphosate based formulation was tested which is not the representative formulation for the glyphosate EU renewal (the representative formulation is MON 52276).
67	Ecotoxicology	Jaiswal K. K. et al.	2020	Impact of glyphosate herbicide stress on metabolic growth and lipid inducement in Chlorella sorokiniana UUIND6 for biodiesel production.	Algal Research-Biomass Biofuels and Bioproducts (2020), Vol. 51, Art. No. 102071	The article has been classified as not relevant by full text for the following reason: The formulations used in this study contain POEA surfactant which is not permitted in formulated herbicidal products in the EU. The tested individuals were collected from a wastewater source and previous pesticide exposure cannot be excluded. No analytical verifications of the test item concentrations in the test media were conducted. The test is not conducted according to the OECD TG 201 and therefore, it is not possible to confirm whether the study meets the validity criteria. No statistical analysis was provided/conducted. In the preliminary test, behaviour of the control after 96h is not properly reported. IC50 was calculated at 96h (instead of 72h as proposed by the OECD TG 201).
68	Ecotoxicology	Khadra M. et al.	2018	Age matters: Submersion period shapes community composition of lake biofilms under glyphosate stress.	FACETS (2018), Vol. 3, pp. 934-951	The article has been classified as not relevant by full text for the following reason: This study, investigating the effects of a pulse exposure of glyphosate on the community composition and chlorophyll-a concentrations of lake biofilms at different colonization stages (2 months, 1 year, and 20 years), presents test design and system that are not relevant for the European regulatory purposes. The generated outcomes of the study

Submission Number	Technical section	Author(s)	Year	Title	Source	Reason for not including publication in dossier (based on relevance and reliability criteria)
						(glyphosate and phosphorous concentrations, chlorophyll-a concentrations and community composition between different treatments) are not relatable to the EU level risk assessment. In addition, the publication is not dealing with EU representative conditions, although the exposure to glyphosate is under laboratory conditions, the biological community and the water were obtained from a lake in Canada. Due to the limitations of the study design reflecting a surface water exposure system specific to Canada, it is difficult to relate the findings to an EU situation from a risk assessment perspective.
69	Ecotoxicology	Pochron S. T. et al.	2021	Earthworms Eisenia fetida recover from Roundup exposure.	Applied Soil Ecology (2021), Vol. 158, Art. No. 103793	The article has been classified as not relevant by full text for the following reason: Roundup Ready to use III is a mixture of IPA salt at 2% and pelargonic acid at 2%. Observations caused by mixture of compounds / potentially causal factors and thus not attributable to a substance of concern (e.g. mixture toxicity). In addition, in this study the source of the tested earthworm is insufficiently described so previous exposure to pesticides cannot be excluded. Soil moisture was not reported and only one concentration was tested.
70	Ecotoxicology	Pompermaier A. et al.	2020	Waterborne agrichemicals compromise the anti-predatory behavior of zebrafish.	Environmental science and pollution research international (2020), Vol. 27, No. 31, pp. 38559-38567	The article has been classified as not relevant by full text for the following reason: Study design and test system in the study are not relevant for the European regulatory purposes. Exposure not confirmed, test item identity not confirmed. Fish were only exposed for 30 minutes and the outcome of anti-predator behaviour after axposure is not relevant for the European regulatory purpose / no endpoints presented that could be applied to an EU level risk assessmemnt for renewal purposes.
71	Ecotoxicology	Roques J. A. C. et al.	2020	Stress response in terrestrial isopods: A comparative study on glycaemia.	Applied Soil Ecology (2020), Vol. 156, pp. Art. No. 103708	The article has been classified as not relevant by full text for the following reason: The usefulness of this study is low as it cannot be related to a data requirement. A consequence of low active content (170 g/L) is that the amount of co-formulant applied to the carrots would have been increased, which was not assessed. The exposure is also unreaslistic with leaves and carrots soaked in solution for 15 minutes and remaining solution pipetted into the arenas, weekly for 25 days, worst case. The glucose results cannot be related. Characterization of soil (texture like sandy loam and pH) and source was not clearly described, just as moistened compost. Test conditions like temperature and humidity/soil moisture insufficiently described.There is no purity information presented in the paper and the exposure was not confirmed. The endpoints do not inform on risk assessment and is unclear how they can be used in a risk assessment. Therefore the study is not relevant.

Submission Number	Technical section	Author(s)	Year	Title	Source	Reason for not including publication in dossier (based on relevance and reliability criteria)
72	Ecotoxicology	Ruuskanen S. et al.	2020	Glyphosate-based herbicides influence antioxidants, reproductive hormones and gut microbiome but not reproduction: A long-term experiment in an avian model.	Environmental pollution (2020), Vol. 266, No. Pt 1, Art. No. 115108	The article has been classified as not relevant by full text for the following reason: The results cannot be related to the risk assessment and do not inform on population level effects and therefore not relevant. Also, the formulation tested is not relevant (Roundup Flex® - 480 g/L glyphosate, present as 588 g/L [43.8% w.w] of potassium salt of glyphosate with surfactants alkylpolyglycoside and nitrotryl).
73	Ecotoxicology	Zhao H. et al.	2020	Transcriptomic and metabolomic landscape of the molecular effects of glyphosate commercial formulation on Apis mellifera ligustica and Apis cerana cerana.	The Science of the total environment (2020), Vol. 744, Art. No. 110558	The article has been classified as not relevant by full text for the following reason: This study, dealing with the mode of action of glyphosate on bees at the molecular level (the numbers of differentially expressed genes and metabolites under glyphosate stress), presents findings based on cellular/molecular level that cannot be related to the risk assessment. The generated outcomes are not relatable to the EU level risk assessment. These effects do not necessarily proof correspondance to adverse ecotoxicological effects.
74	Ecotoxicology	Zheng T. et al.	2021	Effects of chronic glyphosate exposure on antioxdative status, metabolism and immune response in tilapia (GIFT, Oreochromis niloticus).	Comparative biochemistry and physiology, Part C (2021), Vol. 239, Art. No. 108878	The article has been classified as not relevant by full text for the following reason: This study, evaluating the chronic toxicity of glyphosate on fish (tilapia) via determining antioxidative status, metabolism, inflammation and immune response, presents findings based on cellular/molecular level that cannot be related to the risk assessment. The generated outcomes are not relatable to the EU level risk assessment. These effects do not necessarily proof correspondance to adverse ecotoxicological effects. In addition, the test item has not been identified at all.
75	Fate and behaviour in the environment	Chen L. et al.	2020	Effective glyphosate degradation through the combination of ozone/hydrogen peroxide oxidation and coagulation.	Desalination and Water Treatment (2020), Vol. 204, pp. 377-387	The article has been classified as not relevant by full text for the following reason: The article focuses on the effect of ozone and hydrogen peroxide treatment on glyphosate removal in industrial wastewater treatment of pesticide-producing industry. For the experiments, artificial colored "glyphosate-simulated wastewater" was used. No information on glyphosate analysis or concentration is reported. The article is therefore considered not relevant to the data requirement.
76	Fate and behaviour in the environment	Imfeld G. et al.	2020	Do rainfall characteristics affect the export of copper, zinc and synthetic pesticides in surface runoff from headwater catchments?	Science of the total environment (2020), Vol. 741, Art. No. 140437	The article has been classified as not relevant by full text for the following reason: Glyphosate was not the substance of concern, glyphosate was not included in the 12 pesticides analysed.
77	Fate and behaviour in the environment	Korgmaa V. et al.	2020	Removal of hazardous substances in municipal wastewater treatment plants.	Water Science & Technology (2020), Vol. 81, No. 9, pp. 1-12	The article has been classified as not relevant by full text for the following reason: The article focuses on the removal efficiency of municipal wastewater treatment plants for different pollutants, amongst them glyphosate & AMPA, and the influence of the level of complexity as well as operators' competency. No results of analysis of glyphosate or AMPA are reported. Therefore, the article is considered not relevant to the data requirements.

Submission Number	Technical section	Author(s)	Year	Title	Source	Reason for not including publication in dossier (based on relevance and reliability criteria)
78	Fate and behaviour in the environment	Kulikova N. A. et al.	2020	Monoammonium Phosphate Effects on Glyphosate in Soils: Mobilization, Phytotoxicity, and Alteration of the Microbial Community.	Eurasian Soil Science (2020), Vol. 53, No. 6, pp. 787-797	The article has been classified as not relevant by full text for the following reason: The article focuses on the amount of water-extractable glyphosate and AMPA from soils treated with glyphosate with or without addition of monoammonium phosphate. Further, the number of copies of 16S rRNA genes of bacteria was analysed to on the abundance of functional genes of bacteria responsible for glyphosate degradation. As neither degradation nor adsorption is investigated, the article is considered not relevant to the data requirements.
79	Residues in or on treated products, food and feed	Poppenga R. H. et al.	2020	Commercial and Industrial Chemical Hazards for Ruminants: An Update.	Veterinary Clinics of North America - Food Animal Practice (2020), Vol. 36, No. 3, pp. 621-639	The article has been classified as not relevant by full text for the following reason: Article only provides general information on the use of glyphosate and potential exposure of livestock to glyphosate residues. No monitoring data or any experimental data provided.
80	Residues in or on treated products, food and feed	Rebouillat P. et al.	2020	Estimated dietary pesticide exposure from plant-based foods using NMF-derived profiles in a large sample of French adults.	European Journal of Nutrition (2020): Ahead of Print. doi.org/10.1007/s00394-020-02344-8	The article has been classified as not relevant by full text for the following reason: Publication is dealing with general pesticide exposures (not glyphosate specific). Purpose of the study was to identify dietary pesticide exposure profiles from conventional and organic food. No information on direct exposure to glyphosate and no reporting of effects.
81	Toxicology and metabolism	Barukcic I.	2020	Glyphosate and non-hodgkin lymphoma: no causal relationship.	Journal of Drug Delivery and Therapeutics (2020), Vol. 10(1Suppl.), pp. 6-29	The article has been classified as not relevant by full text for the following reason: Review article - the method did not follow accepted epidemiologic practice and the methodology was very uncertain.
82	Toxicology and metabolism	Bootsikeaw S. et al.	2020	Urinary glyphosate biomonitoring of sprayers in vegetable farm in Thailand.	HUMAN AND ECOLOGICAL RISK ASSESSMENT (2020): Ahead of print doi.org/10.1080/10807039.2020.1797471	The article has been classified as not relevant by full text for the following reason: This is an exposure study conducted in Thailand. The study aimed to measure glyphosate exposure concentrations through inhalation, dermal contact, and urinary glyphosate concentrations among 43 vegetable farmers. However, use of test item is unclear - no comment on how workers in this study were exposed, neither by what test item, nor the amount, time, frequency etc. The article is lacking important information, cannot be used in risk assessment, and is therefore not relevant.
83	Toxicology and metabolism	Bozzini E.	2020	Contrasting norms on the use of evidence in risk assessment: the controversy surrounding the carcinogenicity of glyphosate.	Health, Risk & Society (2020), Vol. 22, No. 3/4, pp. 197-213	The article has been classified as not relevant by full text for the following reason: The article discusses differences in the outcome of risk assessment by IARC and EFSA using glyphosate as example. On the basis of the glyphosate case study, the article discusses advantages and shortcomings of different procedural norms for the selection and evaluation of scientific evidence, and their implications for the overall quality of risk assessments. The article is not relevant as this is an opinion article where no new data is provided that can be used for risk assessment. The article proves no new data.

Submission Number	Technical section	Author(s)	Year	Title	Source	Reason for not including publication in dossier (based on relevance and reliability criteria)
84	Toxicology and metabolism	Connolly A. et al.	2020	Human Biomonitoring of Glyphosate Exposures: State-of-the-Art and Future Research Challenges.	Toxics (2020), Vol. 8, No. 3, Art. No. 60	The article has been classified as not relevant by full text for the following reason: Review on studies that use human biomonitoring to measure urinary glyphosate and AMPA in occupationally and non-occupationally exposed population. Overall objective of the publication is to evaluate and standardise the results of the current state-of-the-art in glyphosate exposure assessment using human biomonitoring (urine samples), to evaluate the internal glyphosate concentrations to health-based guidance values, to outline the gaps in knowledge that are still required for interpretation of human biomonitoring data (human glyphosate metabolism and excretion), and to propose recommendations for sampling strategies, all of which could inform future studies investigating population exposures to glyphosate. This article is not relevant as it only provides secondary information (scientific and regulatory reviews), no correlation to glyphosate / glyphosate product and effects).
85	Toxicology and metabolism	Duke S. O.	2020	Glyphosate exposure and toxicology.	Pest Management Science (2020), Vol. 76, No. 9, pp. 2873	The article has been classified as not relevant by full text for the following reason: Editorial opinion article providing no new data. Not relevant for the risk assessment.
86	Toxicology and metabolism	Miroshnikova D. I. et al.	2019	The severity of endogenous intoxication and oxidative stress in the blood of workers in contact with glycine derivatives.	Gigiena i Sanitariya (2019), No. 8, pp. 851-856	The article has been classified as not relevant by full text for the following reason: Cross-sectional study so the temporal exposure-outcome sequence cannot be established. There was a convenience control group and apparent lack of control for potentially confounding factors. Unclear when the exposures took place relative to the study's blood collection. Duration of exposure not mentioned. A cross-sectional study, but the study design is not specified.
87	Toxicology and metabolism	Nerozzi C. et al.	2020	Effects of Roundup and its main component, glyphosate, upon mammalian sperm function and survival.	Scientific reports (2020), Vol. 10, No. 1, Art. No. 11026	The article has been classified as not relevant by full text for the following reason: Glyphosate concentration tested was not physiological (5-360 µg/mL).
88	Toxicology and metabolism	Nova P. et al.	2020	Glyphosate in Portuguese Adults - A Pilot Study.	Environmental toxicology and pharmacology (2020), Vol. 80, Art. No. 103462	The article has been classified as not relevant by full text for the following reason: Publication is dealing with general pesticide exposures (not glyphosate specific). Urine samples were collected from Portuguese adults of the general population (non occupational exposure) and investigated for the presence of GLY and AMPA. Systematically available internal dose levels were calculated retrospectively.
89	Toxicology and metabolism	Pierce J. S. et al.	2020	Pilot study evaluating inhalation and dermal glyphosate exposure resulting from simulated heavy residential consumer application of Roundup(®).	Inhalation toxicology (2020), Vol. 32, No. 8, pp. 354-367	The article has been classified as not relevant by full text for the following reason: In this study, exposure of consumer applicants to Roundup Weed & Grass Killer Super Concentrate containing 50.2% glyphosate was monitored. However, the formulation is not the AIR5 relevant formulation containing 360 g/L and the article therefore not relevant for risk assessment.

Submission Number	Technical section	Author(s)	Year	Title	Source	Reason for not including publication in dossier (based on relevance and reliability criteria)
90	Toxicology and metabolism	Plewis I.	2020	Pesticides and transgenerational inheritance of pathologies: Designing, analysing and reporting rodent studies.	PLoS ONE (2020) Vol. 15, No. 10, Art. No. e0228762	The article has been classified as not relevant by full text for the following reason: The article is a meta analysis of five different publications from Washington state university, analysing generational effects of pesticides (Atrazine, Vinclozolin, Methoxychlor, Permerthrin and Glyphosate) on rodents. The focus of this publication is the missing statistical analysis of litter effects within the mentioned studies.
91	Toxicology and metabolism	Rydz C. E. et al.	2020	Estimating Exposure to Three Commonly Used, Potentially Carcinogenic Pesticides (Chlorolathonil, 2,4-D, and Glyphosate) Among Agricultural Workers in Canada.	Annals of work exposures and health (2020): Ahead of print. doi: 10.1093/annweh/wxaa109	The article has been classified as not relevant by full text for the following reason: Publication is dealing with general pesticide exposures (not glyphosate specific). The study estimated exposure to 3 commonly used pesticides, among them glyphosate, in Canada's agricultural industry. No details on exposure, no reporting on effects related to pesticide exposure.
92	Toxicology and metabolism	Schaeffer J. W. et al.	2020	A pilot study to assess inhalation exposures among sugarcane workers in guatemala: Implications for chronic kidney disease of unknown origin.	International Journal of Environmental Research and Public Health (2020), Vol. 17, No. 16, Art. No. 5708	The article has been classified as not relevant by full text for the following reason: The publication was investigating the amount of glyphosate present in the environment. Monitoring without correlation to exact exposure or related effects. No information provided affecting the risk assessment.
93	Toxicology and metabolism	Ujowundu C. O. et al.	2020	Biochemical and liver histological changes in rats exposed to sub-lethal dose of Uproot-pesticide and the protective potentials of nutritional supplements.	Journal of Applied Biology & Biotechnology (2020), Vol. 8, No. 4, pp. 26-32	The article has been classified as not relevant by full text for the following reason: Intraperitoneal injection is not a preferred route of administration for an in vivo study. In addition, the publication is dealing with a glyphosate formulation Uproot containing POEA. The representative formulation for the glyphosate AIR5 does not contain POEA. POEA is banned in the EU. Thus the paper is not relevant to the EU glyphosate renewal.
94	Toxicology and metabolism / Medical data	Wijerathna T. M. et al.	2020	Cellular injury leading to oxidative stress in acute poisoning with potassium permanganate/oxalic acid, paraquat, and glyphosate surfactant herbicide.	Environmental toxicology and pharmacology (2020), Vol. 80, Art. No. 103510	The article has been classified as not relevant by full text for the following reason: This paper describes using the biomarker of CytoC in Acute Kidney Injury in patients who ingested pesticides, including 27 cases of formulated glyphosate ingestion. Surfactants are known to cause caustic injury, hemodynamic instability and shock. It is not surprising, therefore, to see patients develop AKI in this setting. Mitochondrial injury is not unusual in hypovolemic shock, the authors are exploring the use of CytoC as an early biomarker for predicting who will develop acute renal dysfunction. Since this is in the setting of overdose rather than occupational exposure, the paper is not relevant for the regulatory risk assessment.

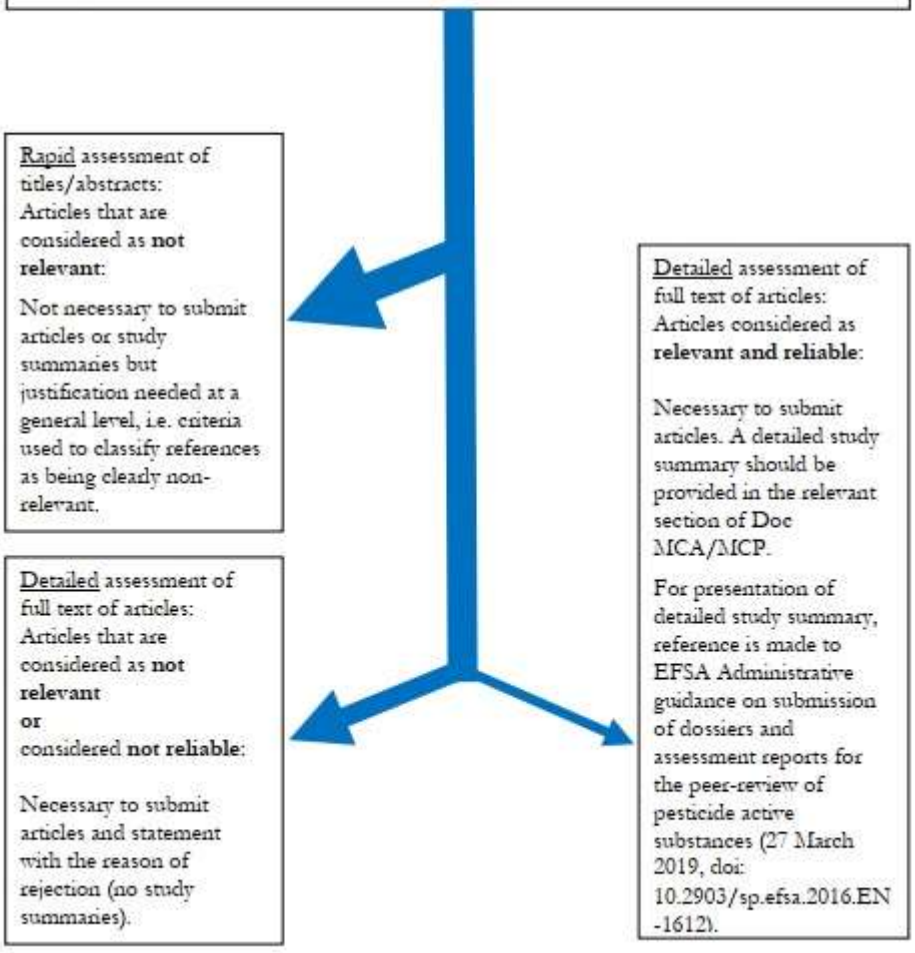
Appendix 1: AGG ADVICE on how to present the literature search in the dossier

ASSESSMENT GROUP ON GLYPHOSATE (AGG)

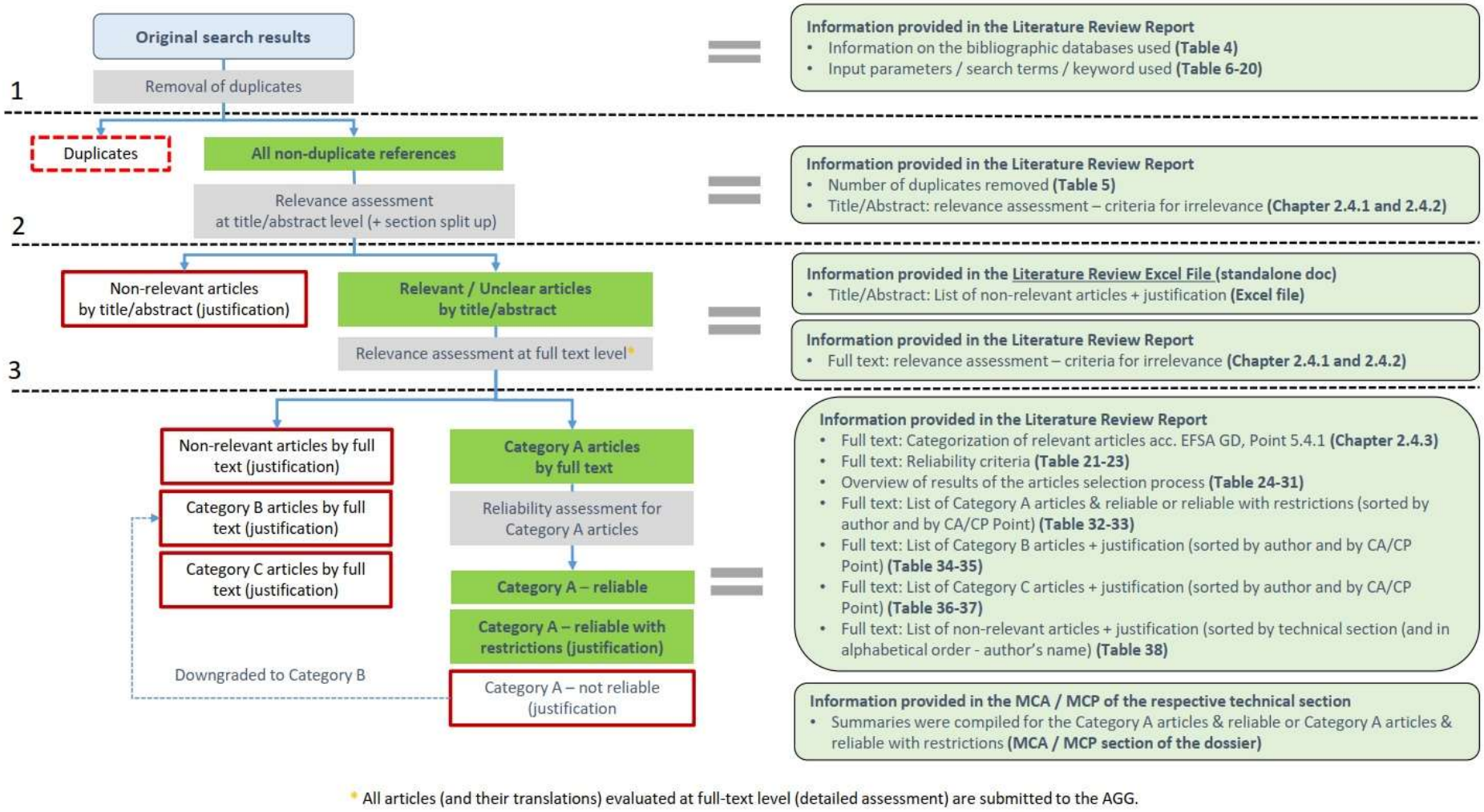
October 2019

ADVICE TO GTF2:
HOW TO PRESENT THE LITERATURE SEARCH
IN THE DOSSIER TO BE SUBMITTED JUNE 2020

The literature search should be carried out and presented as recommended in the EFSA Guidance EFSA Journal 2011;9(2):2092) including its recently published Appendix, available at the EFSA Journal.



Appendix 2: The process of articles selection



* All articles (and their translations) evaluated at full-text level (detailed assessment) are submitted to the AGG.

Appendix 3: ORIGINAL SEARCH QUERY - July 2020 – December 2020

Preparing the search queries on STN:

```
    FILE 'STNGUIDE' ENTERED AT 13:42:41 ON 04 JAN 2021
CHARGED TO COST=113898
L1          QUE SPE=ON  ABB=ON  PLU=ON  GLYPHOSAT? OR GLIFOSAT? OR
            GLYFOSAT? OR 1071-83-6 OR 38641-94-0 OR 70901-12-1 OR 39600-42-
            5 OR 69200-57-3 OR 34494-04-7 OR 114370-14-8 OR 40465-66-5 OR
            69254-40-6 OR AMINOMETHYL PHOSPHONIC OR AMINOMETHYLPHOSPHONIC
            OR 1066-51-9
            SAVE TEMP L1 GLY1/Q
L2          QUE SPE=ON  ABB=ON  PLU=ON  2 ACETYL PHOSPHONOMETHYL AMINO
            ACETIC ACID OR N ACETYL GLYPHOSATE OR N ACETYLGLYPHOSATE OR N
            ACETYL N PHOSPHONOMETHYL GLYCINE OR 129660-96-4 OR N ACETYL
            AMPA OR ACETYLAMINO METHYL PHOSPHONIC ACID OR ACETYLAMINOMETHYL
             PHOSPHONIC ACID OR 57637-97-5
            SAVE TEMP L2 GLY2/Q
L3          QUE SPE=ON  ABB=ON  PLU=ON  2617-47-2 OR HYDROXYMETHANEPHOSPHON
            IC ACID OR HYDROXYMETHYL PHOSPHONATE OR HYDROXYMETHYL PHOSPHONI
            C ACID OR METHANEHYDROXYPHOSPHONIC ACID OR PHOSPHONIC ACID(1W)H
            YDROXYMETHYL OR PHOSPHONOMETHANOL
L4          QUE SPE=ON  ABB=ON  PLU=ON  HYDROXYMETHYLPHOSPHONATE OR
            HYDROXYMETHYLPHOSPHONIC ACID
L5          QUE SPE=ON  ABB=ON  PLU=ON  L3 OR L4
            SAVE TEMP L5 GLY3/Q
L6          QUE SPE=ON  ABB=ON  PLU=ON  35404-71-8 OR METHYLAMINO METHYL
            PHOSPHONIC ACID OR METHYLAMINOMETHYL PHOSPHONIC ACID OR
            METHYLAMINOMETHYLPHOSPHONIC ACID OR N METHYL AMPA OR NSC
            244826 OR PHOSPHONIC ACID METHYLAMINO METHYL OR PHOSPHONIC
            ACID P METHYLAMINO METHYL
L7          QUE SPE=ON  ABB=ON  PLU=ON  2 3 DIHYDROXY 1 OXOPROPYL AMINOMETH
            YL PHOSPHONIC ACID OR 2 3 DIHYDROXY 1 OXOPROPYL AMINOMETHYLPHOS
            PHONIC ACID OR N GLYCERYL AMPA
L8          QUE SPE=ON  ABB=ON  PLU=ON  3 OXO 3 PHOSPHONOMETHYL AMINO
            PROPANOIC ACID OR 3 OXO 3 PHOSPHONOMETHYL AMINOPROPANOIC ACID
            OR N MALONYL AMPA
L9          QUE SPE=ON  ABB=ON  PLU=ON  993-13-5 OR DIHYDROGEN METHYLPHOSPH
            ONATE OR METHANEPHOSPHONIC ACID OR METHYL PHOSPHONIC ACID OR
            METHYLPHOSPHONIC ACID OR NSC 119358 OR PHOSPHONIC ACID METHYL
            OR PHOSPHONIC ACID P METHYL
L10         QUE SPE=ON  ABB=ON  PLU=ON  (L6 OR L7 OR L8 OR L9)
            SAVE TEMP L10 GLY4/Q
L11         QUE SPE=ON  ABB=ON  PLU=ON  24569-83-3 OR 2 METHYL PHOSPHONOMET
            HYL AMINO ACETIC ACID OR 2 METHYL PHOSPHONOMETHYL AMINOACETIC
            ACID OR ACETIC ACID 2 N METHYL N PHOSPHONATOMETHYL AMINO OR
            GLYCINE N METHYL N PHOSPHONOMETHYL OR GLYPHOSATE N METHYL OR
            METHYL GLYPHOSATE
L12         QUE SPE=ON  ABB=ON  PLU=ON  METHYL PHOSPHONOMETHYL AMINO
            ACETIC ACID OR METHYL PHOSPHONOMETHYL AMINOACETIC ACID OR N
            METHYL N PHOSPHONOMETHYL GLYCINE OR N METHYLGLYPHOSATE OR N
            PHOSPHONOMETHYL N METHYL GLYCINE OR N PHOSPHONOMETHYL N
            METHYLGLYCINE
L13         QUE SPE=ON  ABB=ON  PLU=ON  (L11 OR L12)
            SAVE TEMP L13 GLY5/Q
L14         QUE SPE=ON  ABB=ON  PLU=ON  TOX? OR HAZARD? OR ADVERSE OR
            HEALTH OR NOAEL OR NOEL OR LOAEL OR LOEL OR BMD? OR IN VIVO OR
            IN VITRO OR INVIVO OR INVITRO OR MODE OF ACTION OR SKIN? OR
            EYE? OR IRRIT? OR SENSI? OR ALLERG?
L15         QUE SPE=ON  ABB=ON  PLU=ON  RAT OR RATS OR DOG? OR RABBIT? OR
            GUINEA PIG? OR MOUSE OR MICE OR METABOLISM OR METABOLITE? OR
            METABOLIC OR DISTRIBUTION OR ADSORPTION OR EXCRETION OR
            ELIMINATION OR KINETIC OR CYTOCHROME OR ENZYM?
L16         QUE SPE=ON  ABB=ON  PLU=ON  GEN? OR MUTA? OR CHROMOS? OR
            CLASTOGEN? OR DNA OR CARCINO? OR CANCER? OR TUMOR? OR TUMOUR?
            OR ONCOG? OR ONCOL? OR MALIGN? OR IMMUN? OR NEUR? OR ENDOCRIN?
            OR HORMON? OR GONAD? OR DISRUPT?
L17         QUE SPE=ON  ABB=ON  PLU=ON  REPRODUCT? OR DEVELOPMENT? OR
            MALFORM? OR ANOMAL? OR FERTIL? OR FOET? OR FET? OR MATERN? OR
            PREGNAN? OR EMBRYO? OR EPIDEM? OR MEDICAL? OR POISON? OR
            EXPOSURE OR OPERATOR? OR BYSTANDER? OR RESIDENT? OR WORKER? OR
            OCCUPAT?
L18         QUE SPE=ON  ABB=ON  PLU=ON  BIOMONITORING OR HUMAN EXPOSURE OR
            MICROBIOME OR OXIDATIVE STRESS OR APOPTOSIS OR NECROSIS OR
            CYTOTOXICITY OR POLYOXYETHYLENEAMINE OR POEA OR SURFACTANT OR
            RISK ASSESSMENT?
L19         QUE SPE=ON  ABB=ON  PLU=ON  (L14 OR L15 OR L16 OR L17 OR L18)
            SAVE TEMP L19 TOX/Q
L20         QUE SPE=ON  ABB=ON  PLU=ON  UPTAKE OR TRANSLOCATION OR RUMEN
            OR STORAGE STABILITY OR STORAGE OR STABILITY OR METABOLIC OR
            METABOLISM OR BREAKDOWN OR NATURE OF RESIDUES OR RESIDUE? OR
            MAGNITUDE OF RESIDUES OR PROCESS? OR EFFECTS OF PROCESSING
L21         QUE SPE=ON  ABB=ON  PLU=ON  DESSICANT OR PREHARVEST OR
            PREEMERG? OR ?RESISTANT? OR ?TOLERAN? OR TRANSGENIC OR
            HYDROLY? OR ROTATION? OR SUCCEED? OR PLANT? OR CROP? OR FEED?
            OR ANIMAL? OR LIVESTOCK? OR HEN OR CATTLE OR RUMINANT?
L22         QUE SPE=ON  ABB=ON  PLU=ON  GOAT? OR COW? OR PIG? OR DIETARY
            OR ASSESSMENT OR RISK ASSESSMENT OR CONSUM? OR EXPOSURE
L23         QUE SPE=ON  ABB=ON  PLU=ON  (L20 OR L21 OR L22)
            SAVE TEMP L23 RES/Q
L24         QUE SPE=ON  ABB=ON  PLU=ON  SOIL OR WATER OR SEDIMENT OR
            DEGRADAT? OR PHOTO? OR SOIL RESIDUES OR SOIL ACCUMULAT? OR
            SOIL CONTAMINAT? OR MOBILITY OR SORPTION OR COLUMN LEACHING OR
            AGED RESIDUE OR LEACH? OR LYSIMETER OR GROUNDWATER
L25         QUE SPE=ON  ABB=ON  PLU=ON  CONTAMINAT? OR MICROB? OR EXUDATION
             OR RHIZOSPHERE OR DISSIPATION OR SATURATED ZONE OR HYDROLYSIS
            OR DRIFT OR RUN-OFF  OR RUNOFF OR DRAINAGE OR VOLAT? OR
            ATMOSPHERE OR LONG-RANGE TRANSPORT OR SHORT-RANGE TRANSPORT
L26         QUE SPE=ON  ABB=ON  PLU=ON  TRANSPORT OR MICRONUTRIENT OR
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PHOSPHATE OR IRON OR MANGANESE OR HALF-LIFE OR HALFLIFE OR HALF-LIVES OR HALFLIVES OR DT50 OR KINETICS OR OFF-SITE MOVEMENT OR REMOVAL OR DRINKING WATER OR WATER TREATMENT PROCESSES
L27 QUE SPE=ON ABB=ON PLU=ON ATMOSPHERIC DEPOSITION OR TILE-DRAINS OR SURFACE WATER OR MONITORING DATA OR DISINFECTANT OR OZONE OR TILLAGE OR INFILTRATION OR HARD SURFACE OR RAINWATER OR RAIN WATER OR CHELAT? OR COMPLEX? OR MINERALIZATION OR PERSISTENCE OR LIGAND
L28 QUE SPE=ON ABB=ON PLU=ON (L24 OR L25 OR L26 OR L27)
SAVE TEMP L28 FATE/Q
L29 QUE SPE=ON ABB=ON PLU=ON TOX? OR ECOTOX? OR ?TOXIC OR ?TOXICITY OR HAZARD OR ADVERSE OR ENDOCRINE DISRUPT? OR BIOACCUMULATE? OR BIOMAGNIFI? OR BIOCONCENTRATION OR POISON OR EFFECT OR INDIRECT EFFECT? OR DIRECT EFFECT? OR BIODIVERS? OR PROTECTION GOALS OR ECO?
L30 QUE SPE=ON ABB=ON PLU=ON IMPACT OR POPULATION OR COMMUNITY OR WILDLIFE OR INCIDENT OR PEST OR BIRD? OR ACUTE OR CHRONIC OR LONG-TERM OR MALLARD OR DUCK OR QUAIL OR BOBWHITE OR ANAS? OR COLINUS? OR WILD OR DIETARY OR AQUATIC OR FISH OR DAPHNI? OR ALG? OR CHIRON?
L31 QUE SPE=ON ABB=ON PLU=ON SEDIMENT DWELL? OR BENTHIC OR LEMNA OR MARIN? OR ESTUARINE OR CRUSTA? OR GASTROPOD? OR INSECT OR MOLLUSC OR REPTILE OR AMPHIB? OR BEE? OR APIS OR APIDAE OR BUMBLE? OR COLONY OR HIVE OR POLLINATOR
L32 QUE SPE=ON ABB=ON PLU=ON PLANT AND (SUBMERGE? OR EMERGE?)
L33 QUE SPE=ON ABB=ON PLU=ON SOLITARY OR ALG? OR AQUATIC OR FRESHWATER OR VERTEBRAT? OR MAMMAL? OR RAT OR MOUSE OR MICE OR RABBIT OR HARE OR PROTECTION OR MODEL? OR VOLE OR PEST OR ARTHROPOD? OR BENEFICIALS OR TYPHLODROMUS OR APHIDIUS OR PARASITOID
L34 QUE SPE=ON ABB=ON PLU=ON PREDATOR OR CHRYSOPERLA OR ORIUS OR SPIDER OR WORM? OR ?WORM OR EISENIA OR SOIL OR COLLEMBOL? OR MACRO ORGANISM OR FOLSOMIA OR SPRINGTAIL OR DECOMPOS? OR MICRO ORGANISMS OR MICROORGANISMS OR MICROBIAL OR CARBON OR NITROGEN
L35 QUE SPE=ON ABB=ON PLU=ON PLANT? OR VEGETATIVE VIGO? OR SEEDLING OR GERMINATION OR MONOCOT? OR DICOT? OR SEWAGE OR ACTIVATED SLUDGE OR BIODEGRAD? OR BIOACCUMULATION? OR AMPHIB? OR REPTILE? OR AQUATIC PLANT OR BENEFICIAL
L36 QUE SPE=ON ABB=ON PLU=ON (L29 OR L30 OR L31 OR L32 OR L33 OR L34 OR L35)
SAVE TEMP L36 ECO/Q

SESSION WILL BE HELD FOR 120 MINUTES
STN INTERNATIONAL SESSION SUSPENDED AT 13:58:53 ON 04 JAN 2021

Final search - Update Jan 2021:

FILE 'MEDLINE' ENTERED AT 15:45:08 ON 05 JAN 2021
CHARGED TO COST=113898
L1 4440 SEA SPE=ON ABB=ON PLU=ON GLY1/Q OR GLY2/Q OR GLY3/Q OR GLY4/Q OR GLY5/Q
L2 238 SEA SPE=ON ABB=ON PLU=ON L1 AND ED>20200702
L3 237 SEA SPE=ON ABB=ON PLU=ON L2 NOT (COMMENT? OR DISSERTATION OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/DT
SAVE TEMP L3 GLYMEDL/A

FILE 'AGRICOLA' ENTERED AT 15:50:40 ON 05 JAN 2021
CHARGED TO COST=113898
L4 7335 SEA SPE=ON ABB=ON PLU=ON GLY1/Q OR GLY2/Q OR GLY3/Q OR GLY4/Q OR GLY5/Q
L5 125 SEA SPE=ON ABB=ON PLU=ON L4 AND ED>20200702
L6 125 SEA SPE=ON ABB=ON PLU=ON L5 NOT (COMMENT? OR DISSERTATION OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/DT
SAVE TEMP L6 GLYAGRI/A

FILE 'BIOSIS' ENTERED AT 15:53:45 ON 05 JAN 2021
CHARGED TO COST=113898
L7 11508 SEA SPE=ON ABB=ON PLU=ON GLY1/Q OR GLY2/Q OR GLY3/Q OR GLY4/Q OR GLY5/Q
L8 348 SEA SPE=ON ABB=ON PLU=ON L7 AND ED>20200702
L9 291 SEA SPE=ON ABB=ON PLU=ON L8 NOT (COMMENT? OR DISSERTATION OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/DT
SAVE TEMP L9 GLYBIOS/A

FILE 'CABA' ENTERED AT 15:57:07 ON 05 JAN 2021
CHARGED TO COST=113898
L10 19085 SEA SPE=ON ABB=ON PLU=ON GLY1/Q OR GLY2/Q OR GLY3/Q OR GLY4/Q OR GLY5/Q
L11 470 SEA SPE=ON ABB=ON PLU=ON L10 AND ED>20200702
L12 470 SEA SPE=ON ABB=ON PLU=ON L11 NOT (COMMENT? OR DISSERTATION OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/DT
SAVE TEMP L12 GLYCABA/A

FILE 'FSTA' ENTERED AT 15:59:47 ON 05 JAN 2021
CHARGED TO COST=113898
L13 552 SEA SPE=ON ABB=ON PLU=ON GLY1/Q OR GLY2/Q OR GLY3/Q OR GLY4/Q OR GLY5/Q
L14 38 SEA SPE=ON ABB=ON PLU=ON L13 AND ED>20200702
L15 37 SEA SPE=ON ABB=ON PLU=ON L14 NOT (COMMENT? OR DISSERTATION OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/DT
SAVE TEMP L15 GLYFSTA/A

```
    FILE 'PQSCITECH' ENTERED AT 16:02:13 ON 05 JAN 2021
CHARGED TO COST=113898
L16       5521 SEA SPE=ON  ABB=ON  PLU=ON  GLY1/Q OR GLY2/Q OR GLY3/Q OR
             GLY4/Q OR GLY5/Q
L17         95 SEA SPE=ON  ABB=ON  PLU=ON  L16 AND ED>20200702
L18         95 SEA SPE=ON  ABB=ON  PLU=ON  L17 NOT (COMMENT? OR DISSERTATION
             OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/D
             T
             SAVE TEMP L18 GLYPQSCI/A

    FILE 'TOXCENTER' ENTERED AT 16:11:40 ON 05 JAN 2021
CHARGED TO COST=113898
L19      17115 SEA SPE=ON  ABB=ON  PLU=ON  GLY1/Q OR GLY2/Q OR GLY3/Q OR
             GLY4/Q OR GLY5/Q
L20        676 SEA SPE=ON  ABB=ON  PLU=ON  L19 AND ED>20200702
L21        593 SEA SPE=ON  ABB=ON  PLU=ON  L20 NOT (COMMENT? OR DISSERTATION
             OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/D
             T
             SAVE TEMP L21 GLYTOXC/A

    FILE 'EMBASE' ENTERED AT 16:20:46 ON 05 JAN 2021
CHARGED TO COST=113898
L22       5962 SEA SPE=ON  ABB=ON  PLU=ON  GLY1/Q OR GLY2/Q OR GLY3/Q OR
             GLY4/Q OR GLY5/Q
L23        206 SEA SPE=ON  ABB=ON  PLU=ON  L22 AND ED>20200702
L24        204 SEA SPE=ON  ABB=ON  PLU=ON  L23 NOT (COMMENT? OR DISSERTATION
             OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/D
             T
             SAVE TEMP L24 GLYEMBA/A

    FILE 'ESBIOBASE' ENTERED AT 16:26:21 ON 05 JAN 2021
CHARGED TO COST=113898
L25       5219 SEA SPE=ON  ABB=ON  PLU=ON  GLY1/Q OR GLY2/Q OR GLY3/Q OR
             GLY4/Q OR GLY5/Q
L26        201 SEA SPE=ON  ABB=ON  PLU=ON  L25 AND ED>20200702
L27        200 SEA SPE=ON  ABB=ON  PLU=ON  L26 NOT (COMMENT? OR DISSERTATION
             OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/D
             T
             SAVE TEMP L27 GLYESBIO/A

    FILE 'HCAPLUS' ENTERED AT 16:38:29 ON 05 JAN 2021
CHARGED TO COST=113898
L28      29905 SEA SPE=ON  ABB=ON  PLU=ON  GLY1/Q OR GLY2/Q OR GLY3/Q OR
             GLY4/Q OR GLY5/Q
L29        745 SEA SPE=ON  ABB=ON  PLU=ON  L28 AND ED>20200702
L30        504 SEA SPE=ON  ABB=ON  PLU=ON  L29 NOT (COMMENT? OR DISSERTATION
             OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/D
             T
             SAVE TEMP L30 GLYHCAP/A

    FILE 'SCISEARCH' ENTERED AT 16:42:42 ON 05 JAN 2021
CHARGED TO COST=113898
L31      12468 SEA SPE=ON  ABB=ON  PLU=ON  GLY1/Q OR GLY2/Q OR GLY3/Q OR
             GLY4/Q OR GLY5/Q
L32        543 SEA SPE=ON  ABB=ON  PLU=ON  L31 AND ED>20200702
L33        541 SEA SPE=ON  ABB=ON  PLU=ON  L32 NOT (COMMENT? OR DISSERTATION
             OR EDITORIAL OR MEETING? OR NEWS? OR PATENT OR PRESS RELEASE)/D
             T
             SAVE TEMP L33 GLYSCIS/A

    FILE 'MEDLINE, AGRICOLA, BIOSIS, CABA, FSTA, PQSCITECH, TOXCENTER,
    EMBASE, ESBIOBASE, HCAPLUS, SCISEARCH' ENTERED AT 16:47:56 ON 05 JAN 2021
CHARGED TO COST=113898
L34       1797 DUP REM L3 L6 L9 L12 L15 L18 L21 L24 L27 L30 L33 (1500 DUPLICAT
                ANSWERS '1-236' FROM FILE MEDLINE
                ANSWERS '237-361' FROM FILE AGRICOLA
                ANSWERS '362-577' FROM FILE BIOSIS
                ANSWERS '578-964' FROM FILE CABA
                ANSWERS '965-987' FROM FILE FSTA
                ANSWERS '988-1034' FROM FILE PQSCITECH
                ANSWERS '1035-1297' FROM FILE TOXCENTER
                ANSWERS '1298-1370' FROM FILE EMBASE
                ANSWERS '1371-1412' FROM FILE ESBIOBASE
                ANSWERS '1413-1579' FROM FILE HCAPLUS
                ANSWERS '1580-1797' FROM FILE SCISEARCH
             SAVE L34 GLY202101/A
L35       1437 SEA SPE=ON  ABB=ON  PLU=ON  L34 AND TOX/Q
             SAVE TEMP L35 GLYTOX/A
L36       1581 SEA SPE=ON  ABB=ON  PLU=ON  L34 AND RES/Q
             SAVE TEMP L36 GLYRES/A
L37       1062 SEA SPE=ON  ABB=ON  PLU=ON  L34 AND FATE/Q
             SAVE TEMP L37 GLYFATE/A
L38       1676 SEA SPE=ON  ABB=ON  PLU=ON  L34 AND ECO/Q
             SAVE TEMP L38 GLYECO/A
L39       1781 SEA SPE=ON  ABB=ON  PLU=ON  (L35 OR L36 OR L37 OR L38)
             SAVE L39 GLY202101FIN/A

SESSION WILL BE HELD FOR 120 MINUTES
STN INTERNATIONAL SESSION SUSPENDED AT 18:07:02 ON 05 JAN 2021
```