APPENDIX A. ATSDR MINIMAL RISK LEVEL WORKSHEETS

MRLs are derived when reliable and sufficient data exist to identify the target organ(s) of effect or the most sensitive health effect(s) for a specific duration for a given route of exposure. An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified route and duration of exposure. MRLs are based on noncancer health effects only; cancer effects are not considered. These substance-specific estimates, which are intended to serve as screening levels, are used by ATSDR health assessors to identify contaminants and potential health effects that may be of concern at hazardous waste sites. It is important to note that MRLs are not intended to define clean-up or action levels.

MRLs are derived for hazardous substances using the NOAEL/uncertainty factor approach. They are below levels that might cause adverse health effects in the people most sensitive to such chemical-induced effects. MRLs are derived for acute (1–14 days), intermediate (15–364 days), and chronic (≥365 days) durations and for the oral and inhalation routes of exposure. Currently, MRLs for the dermal route of exposure are not derived because ATSDR has not yet identified a method suitable for this route of exposure. MRLs are generally based on the most sensitive substance-induced endpoint considered to be of relevance to humans. Serious health effects (such as irreparable damage to the liver or kidneys, or birth defects) are not used as a basis for establishing MRLs. Exposure to a level above the MRL does not mean that adverse health effects will occur.

MRLs are intended only to serve as a screening tool to help public health professionals decide where to look more closely. They may also be viewed as a mechanism to identify those hazardous waste sites that are not expected to cause adverse health effects. Most MRLs contain a degree of uncertainty because of the lack of precise toxicological information on the people who might be most sensitive (e.g., infants, elderly, nutritionally or immunologically compromised) to the effects of hazardous substances. ATSDR uses a conservative (i.e., protective) approach to address this uncertainty consistent with the public health principle of prevention. Although human data are preferred, MRLs often must be based on animal studies because relevant human studies are lacking. In the absence of evidence to the contrary, ATSDR assumes that humans are more sensitive to the effects of hazardous substance than animals and that certain persons may be particularly sensitive. Thus, the resulting MRL may be as much as 100-fold below levels that have been shown to be nontoxic in laboratory animals.

APPENDIX A

Proposed MRLs undergo a rigorous review process: Health Effects/MRL Workgroup reviews within the Division of Toxicology and Human Health Sciences, expert panel peer reviews, and agency-wide MRL Workgroup reviews, with participation from other federal agencies and comments from the public. They are subject to change as new information becomes available concomitant with updating the toxicological profiles. Thus, MRLs in the most recent toxicological profiles supersede previously published MRLs. For additional information regarding MRLs, please contact the Division of Toxicology and Human Health Sciences, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road NE, Mailstop S102-1, Atlanta, Georgia 30329-4027.

Human exposure to glyphosate formulations via its use in weed control includes exposure to all substances in a particular glyphosate formulation. No MRLs were derived for glyphosate formulations due to the wide variation in glyphosate content and surfactants used in various glyphosate formulations and the fact that surfactants can contribute to the toxicity of glyphosate formulations. However, the general population may be exposed via food or water sources containing glyphosate residues from glyphosate-based formulations registered for use in agricultural and residential environments. Therefore, health effects data associated with oral exposure to glyphosate technical are considered relevant to potential derivation of oral MRLs for glyphosate.

MINIMAL RISK LEVEL (MRL) WORKSHEET

***Chemical Name*:** Glyphosate technical
CAS Numbers: 1071-83-6
Date: August 2020
Profile Status: Final
Route: Inhalation
Duration: Acute

MRL Summary: There are insufficient data for derivation of an acute-duration inhalation MRL.

Rationale for Not Deriving an MRL: No acute-duration inhalation exposure-response studies were identified for glyphosate.

Agency Contact (Chemical Manager): Hana R. Pohl, M.D., Ph.D.

MINIMAL RISK LEVEL (MRL) WORKSHEET

***Chemical Name*:** Glyphosate technical
CAS Numbers: 1071-83-6
Date: August 2020
Profile Status: Final
Route: Inhalation
Duration: Intermediate

MRL Summary: There are insufficient data for derivation of an intermediate-duration inhalation MRL.

Rationale for Not Deriving an MRL: No intermediate-duration inhalation exposure-response studies were identified for glyphosate.

Agency Contact (Chemical Manager): Hana R. Pohl, M.D., Ph.D.

MINIMAL RISK LEVEL (MRL) WORKSHEET

***Chemical Name*:** Glyphosate technical
CAS Numbers: 1071-83-6
Date: August 2020
Profile Status: Final
Route: Inhalation
Duration: Chronic

MRL Summary: There are insufficient data for derivation of a chronic-duration inhalation MRL.

Rationale for Not Deriving an MRL: No chronic-duration inhalation exposure-response studies were identified for glyphosate.

Agency Contact (Chemical Manager): Hana R. Pohl, M.D., Ph.D.

MINIMAL RISK LEVEL (MRL) WORKSHEET

***Chemical Name*:** Glyphosate technical
CAS Numbers: 1071-83-6
Date: August 2020
Profile Status: Final
Route: Oral
Duration: Acute
MRL: 1 mg/kg/day
Critical Effect: Gastrointestinal effects
Reference: EPA 2017b
Point of Departure: NOAEL of 100 mg/kg/day
Uncertainty Factor: 100
LSE Graph Key: 7
Species: Rabbit

MRL Summary: An acute-duration oral MRL of 1 mg/kg/day was derived for glyphosate based on gastrointestinal effects (diarrhea, few feces) observed in pregnant female New Zealand white rabbits administered glyphosate acid (96.5% purity) by daily gavage (in deionized water) during GDs 8–20 (EPA 2017b). The MRL is based on a NOAEL of 100 mg/kg/day and a total uncertainty factor of 100 (10 for animal to human extrapolation and 10 for human variability).

Selection of the Critical Effect: Several acute-duration oral studies were available regarding the toxicity of glyphosate technical following acute-duration oral exposure (see Table A-1). The lowest LOAELs were 175 mg/kg/day for gastrointestinal effects (diarrhea, few feces) in maternal rabbits and 300 mg/kg/day for developmental effects (depressed fetal weight) following gavage treatment with glyphosate technical during GDs 8–20 at 175 mg/kg/day. Based on available data, gastrointestinal disturbance is considered to represent the most sensitive effect of glyphosate toxicity following oral exposure in laboratory animals.

Table A-1. NOAELs and LOAELs Identified in Acute-Duration Oral Studies of Glyphosate Technical

Endpoint	Effect	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	Reference
Body weight	28.5% depressed maternal body weight gain in rats	1,000	3,500	EPA 1992e
	No effect in pregnant rats	1,000		EPA 2017b
	No effect in pregnant rabbits	300		EPA 2017b
Gastrointestinal	Diarrhea in 2/8 rats gavaged once		2,000	Adam et al. 1997
	Diarrhea in rats gavaged once	1,000	2,000	EPA 2013c
	Diarrhea, soft stools in pregnant rats gavaged on GDs 6–19	1,000	3,500	EPA 1992e
	Diarrhea, few feces in pregnant rabbits gavaged on GDs 8–20	100	175	EPA 2017b

Table A-1. NOAELs and LOAELs Identified in Acute-Duration Oral Studies of Glyphosate Technical

Endpoint	Effect	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	Reference
Developmental	Decreased fetal weight; delayed ossification	1,000	3,500	EPA 1992e
	No effect in fetuses from pregnant rats gavaged on GDs 7–16	1,000		EPA 2017b
	Depressed weight in fetuses from pregnant rabbits gavaged on GDs 8–20	175	300	EPA 2017b
Other	Hypothermia in rats gavaged once	1,000	2,000	EPA 2013c

GD = gestation day; LOAEL = lowest-observed-adverse-effect level; NOAEL = no-observed-adverse-effect level

Selection of the Principal Study: Among available acute-duration oral toxicity studies for glyphosate, the developmental toxicity study in rabbits (EPA 2017b) identified the lowest LOAEL (gastrointestinal effects in pregnant rabbits gavaged with glyphosate acid); the corresponding NOAEL was 100 mg/kg/day. Therefore, this study was selected as the principal study for deriving an acute-duration oral MRL for glyphosate.

Summary of the Principal Study:

EPA. 2017b. Memorandum. December 13, 2017. Glyphosate: Preparation of data evaluation records for developmental rat and rabbit toxicity studies. MRID No.: 43320615, 43320616. Washington, DC: U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention.

Groups of sperm-positive female New Zealand white rabbits (20/group) were administered glyphosate acid (95.6% active ingredient) by daily gavage (in deionized water vehicle; dosing volume 2 mL/kg body weight) on GDs 8–20 at target concentrations of 0, 100, 175, or 300 mg/kg/day (adjusted for purity of active ingredient). Dams were monitored for survival, clinical signs, body weight, and food intake. On GD 30, dams were sacrificed and subjected to gross external and internal examination, pregnancy status, weight of gravid uteri, number of corpora lutea, number and position of implantations, live fetuses, and early and late intrauterine deaths. Fetuses were evaluated for weight and sex. External, visceral, and skeletal examinations were performed; brains were subjected to macroscopic examination.

The 100 mg/kg/day dose level represented a NOAEL for maternal toxicity. At 175 and 300 mg/kg/day, maternal rabbits exhibited diarrhea and reduced production of feces. Mean body weight in the 300 mg/kg/day group of maternal rabbits ranged from 5.2 to 7.4% less than that of controls during GDs 16–26. The depressed maternal body weight was <10% in magnitude, and was therefore not considered to represent an adverse effect. Furthermore, there were no statistically significant differences between controls and glyphosate-treated groups regarding GD 30 mean maternal body weight. Gross pathologic examination of maternal rabbits revealed no treatment-related effects. There were no treatment-related effects on pregnancy rate, numbers of corpora lutea, total number of implantation sites, litter size, sex ratio, or pre- or post-implantation loss. The 300 mg/kg/day dose group exhibited 8.3% lower mean fetal weight ($p<0.05$). Gross and visceral examination of fetuses revealed no treatment-related effects. Increased incidences of fetuses with selected minor skeletal defects (e.g., delayed sternebral and vertebral ossification) were observed at the 300 mg/kg/day maternal dose level. However, incidences of these skeletal defects did not appear to be increased in glyphosate-treated groups when

evaluated on a per litter basis; therefore, they were not considered treatment-related developmental effects.

Selection of the Point of Departure: Incidence data for the gastrointestinal effects were not presented in the available data evaluation record (DER) for the study, thus precluding a benchmark dose (BMD) approach to deriving an MRL. Therefore, the NOAEL of 100 mg/kg/day was selected as the point of departure for deriving an acute-duration oral MRL for glyphosate.

Uncertainty Factor: The NOAEL of 100 mg/kg/day was divided by a total uncertainty factor of 100:

- 10 for animal to human extrapolation
- 10 for human variability

Other Additional Studies or Pertinent Information: Glyphosate-induced gastrointestinal effects were observed in acute-duration oral studies of rats (Adam et al. 1997; EPA 1992e, 2013c), although rabbits appear to be much more sensitive than rats to glyphosate-induced gastrointestinal effects following oral dosing.

Agency Contacts (Chemical Managers): Hana R. Pohl, M.D., Ph.D.

MINIMAL RISK LEVEL (MRL) WORKSHEET

***Chemical Name*:** Glyphosate technical
CAS Numbers: 1071-83-6
Date: August 2020
Profile Status: Final
Route: Oral
Duration: Intermediate

MRL Summary: The chronic-duration oral MRL of 1 mg/kg/day is adopted as the intermediate-duration oral MRL.

Rationale for Not Deriving an MRL: Several intermediate-duration oral animal studies were available for glyphosate technical (see Table A-2).

Table A-2. NOAELs and LOAELs Identified in Intermediate-Duration Oral Studies of Glyphosate Technical

Endpoint	Effect	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	Reference
Body weight	12–18% depressed paternal body weight gain in rats	M: 754 F: 802	M: 2,219 F: 3,134	EPA 1992a
	No effect in rats (highest dose)	M, F: 30		EPA 1992g
	No effect in rats (highest dose)	M: 1,234 F: 1,273		EPA 2013a
	18% lower mean body weight and body weight gain in male rats	M: 1,678 F: 3,393	M: 3,393	NTP 1992
	No effect in mice (highest dose)	F: 1,447.5		EPA 2013b
	10–11% lower mean final body weight in mice	M: 2,273 F: 5,846	M: 4,776 F: 11,977	NTP 1992
	No effect in maternal rabbits (highest dose)	F: 350		EPA 1992f
Gastrointestinal	Soft stool in rats	M: 754 F: 802	M: 2,219 F: 3,134	EPA 1992a
	Increased severity of basophilia and hypertrophy of acinar cells in parotid and submandibular salivary glands of rats	M: 205 F: 213	M: 410 F: 421	NTP 1992
	Increased severity of basophilia of acinar cells in parotid salivary gland of mice	M: 1,065 F: 1,411	M: 2,273 F: 2,707	NTP 1992
	Increased incidence of soft stool and/or diarrhea in pregnant rabbits	175	350	EPA 1992f
Hematological	No effect in rats (highest dose)	M, F: 3,393		NTP 1992

Table A-2. NOAELs and LOAELs Identified in Intermediate-Duration Oral Studies of Glyphosate Technical

Endpoint	Effect	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	Reference
Hepatic	No effect in rats (highest dose)	M: 1,234 F: 1,273		EPA 2013a
	M: Increases in liver weight and serum ALT F: Increases in liver weight and serum AP, ALT, and bile acids	M: 811 F: 1,690	M: 1,678 F: 3,393	NTP 1992
	No effect in mice	M: 10,780 F: 11,977		NTP 1992
Renal	No effect in rats (highest dose)	M: 1,234 F: 1,273		EPA 2013a
Immunological	No effect in mice (highest dose)	F: 1,447.5		EPA 2013b
Neurological	No effect in rats (highest dose)	M: 1,546.5 F: 1,630.6		EPA 2013c
Reproductive	No effect in rats (highest dose)	M: 2,219 F: 3,234		EPA 1992a
	No effect in rats (highest dose)	M, F: 30		EPA 1992g
	No effect in rats (highest dose)	M: 1,234 F: 1,273		EPA 2013a
Developmental	14–20% depressed pup body weight during lactation (maternally toxic dose level)	802	3,134	EPA 1992a
	Delayed preputial separation	408	1,234	EPA 2013a
	No effect in rabbits (highest dose)	350		EPA 1992f

ALT = alanine aminotransferase; AP = alkaline phosphatase; F = female; LOAEL = lowest-observed-adverse-effect level; M = male; NOAEL = no-observed-adverse-effect level

Increased incidence of kidney tubular dilation was reported for F3b male weanlings of a 3-generation study of glyphosate technical (98.7% purity) administered to male and female Sprague-Dawley rats in the diet at an estimated dose level of 30 mg/kg/day; the reported NOAEL was 10 mg/kg/day (EPA 1992g). However, there were no signs of treatment-related effects on kidneys of rat offspring in two subsequent 2-generation rat studies at dietary doses up to 1,234 or 1,273 mg/kg/day for parental males and females, respectively (EPA 2013a), or 2,633 or 3,134 mg/kg/day for parental males and females, respectively (EPA 1992a). Therefore, the finding of increased incidence of kidney tubular dilation in the 3-generation rat study (EPA 1992g) was considered a spurious result rather than a glyphosate-induced adverse developmental effect. In one 2-generation oral rat study, exposure via the diet at estimated parental dose levels of 1,234 or 1,273 mg/kg/day (parental males and females, respectively) resulted in delayed preputial separation in male pups (EPA 2013a). In the other 2-generation study, the highest dietary dose level (up to 2,633 and 3,134 mg/kg/day for parental males and females, respectively) resulted in up to 14–20% depressed pup body weight and/or body weight gain during the lactation period (EPA 1992a). There were no apparent treatment-related developmental effects in a study of rabbits treated by gavage at up to 350 mg/kg/day during GDs 6–27 (EPA 1992f).

Consideration was given to the increased anogenital distance (AGD) reported by Manservisi et al. (2019). This pilot study found that male F1 Sprague-Dawley rats exposed to 1.75 mg/kg/day glyphosate technical from gestation day 6 to post-natal day 120 showed increased anogenital distance at postnatal day 4. However, this result was determined to be insufficient for MRL derivation. The study used only one dose, which was substantially lower than the other lowest observed adverse effect levels (LOAELs) and the no observed adverse effect levels (NOAELs) identified in the body of literature. Furthermore, while decreases in AGD are sometimes considered an adverse effect related to endocrine disruption, increases in AGD are less commonly used because the toxicological significance of such increases is not well understood (Schwartz et al. 2019). Given that only one dose was tested, the observed effect was small (6%) and not observed in other studies, and because the relevance of such an effect to human health is not well-understood, it is not appropriate to use this study for MRL derivation.

As shown in Table A-2, gastrointestinal endpoints are the most sensitive to intermediate-duration oral exposure of laboratory animals to glyphosate technical. Pregnant rabbits gavaged with glyphosate technical daily at 350 mg/kg/day (LOAEL) during GDs 6–27 exhibited increased incidence of soft stool and/or diarrhea; the NOAEL was 175 mg/kg/day (EPA 1992f). Similar results were observed among other pregnant rabbits gavaged daily with glyphosate technical at 175 mg/kg/day (LOAEL) during GDs 8–20 (an acute-duration oral exposure scenario); the NOAEL was 100 mg/kg/day (EPA 2017b).

Increased severity of basophilia and hypertrophy of acinar cells in parotid and submandibular salivary glands were observed among male and female rats receiving glyphosate from the diet for 13 weeks at 410 and 421 mg/kg/day, respectively; NOAELs were 205 and 213 mg/kg/day, respectively (NTP 1992). Increased severity of basophilia of acinar cells in parotid salivary glands were observed in male and female mice similarly treated at estimated doses of 2,273 and 2,707 mg/kg/day, respectively; NOAELs were 507 and 753 mg/kg/day, respectively (NTP 1992). Thus, rats appear to be much more sensitive than mice to glyphosate treatment-related effects on salivary glands.

Among reliable animal study results, the LOAEL of 350 mg/kg/day for gastrointestinal effects (increased incidence of soft stool and/or diarrhea) in maternal rabbits gavaged daily during GDs 6–27 represents the most sensitive adverse effect from intermediate-duration oral exposure to glyphosate technical (EPA 1992f); the corresponding NOAEL is 175 mg/kg/day (see Table A-2). Incidence and severity data were not available for review. Application of a NOAEL/LOAEL approach using the NOAEL of 175 mg/kg/day as the point of departure and a total uncertainty factor of 100 (10 for extrapolation from animals to humans and 10 for human variability) would result in an intermediate-duration oral MRL of 2 mg/kg/day (rounded up from 1.75 mg/kg/day). An intermediate-duration oral MRL was not derived for glyphosate because an intermediate-duration oral MRL of 2 mg/kg/day is higher than the acute- and chronic-duration oral MRL of 1 mg/kg/day. Glyphosate-induced microscopic changes in salivary glands of the rats treated orally for 13 weeks are not considered an adequate basis for MRL derivation due to uncertainty regarding the adversity of the effect. However, application of a total uncertainty factor of 100 (10 for extrapolation from animals to humans and 10 for human variability) to the NOAEL of 205 mg/kg/day for salivary gland changes in male rats administered glyphosate in the diet for 13 weeks would result in an intermediate-duration oral MRL of 2 mg/kg/day. The chronic-duration oral MRL of 1 mg/kg/day for glyphosate is adopted as the intermediate-duration oral MRL because 1 mg/kg/day is considered protective of intermediate-duration oral exposure to glyphosate as well.

Agency Contact (Chemical Manager): Hana R. Pohl, M.D., Ph.D.

MINIMAL RISK LEVEL (MRL) WORKSHEET

***Chemical Name*:** Glyphosate technical
CAS Numbers: 1071-83-6
Date: August 2020
Profile Status: Final
Route: Oral
Duration: Chronic
MRL: 1 mg/kg/day
Critical Effect: Inflammation of gastric squamous mucosa
Reference: EPA 1991a, 1991b
Point of Departure: NOAEL of 113 mg/kg/day
Uncertainty Factor: 100
LSE Graph Key: 19
Species: Rat

MRL Summary: A chronic-duration oral MRL of 1 mg/kg/day was derived for glyphosate based on gastrointestinal effects (inflammation of gastric squamous mucosa) observed in female rats administered glyphosate technical in the diet for up to 24 months at an estimated dose of 457 mg/kg/day; the NOAEL was 113 mg/kg/day (EPA 1991a, 1991b). The MRL is based on a NOAEL of 113 mg/kg/day and a total uncertainty factor of 100 (10 for animal to human extrapolation and 10 for human variability).

Selection of the Critical Effect: Several chronic-duration oral animal studies were available for glyphosate technical (see Table A-3).

Table A-3. NOAELs and LOAELs Identified in Chronic-Duration Oral Studies of Glyphosate Technical

Endpoint	Effect	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	Reference
Body weight	13% lower body weight in female rats at treatment week 81	M: 940 F: 457	F: 1,183	EPA 1991a, 1991b
	No effect in rats (highest dose)	M: 31.45 F: 34.02		EPA 1992d
	No effect in rats (highest dose)	M: 1,214 F: 1,498		EPA 2013a
	11–14% lower body weight and body weight gain in rats	300	1,000	EPA 2015c
	No effect in mice (highest dose)	M: 4,945 F: 6,069		EPA 2015a
	No effect in mice (highest dose)	1,000		EPA 2015c
	No effect in dogs (highest dose)	500		EPA 1986a, 1987

Table A-3. NOAELs and LOAELs Identified in Chronic-Duration Oral Studies of Glyphosate Technical

Endpoint	Effect	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	Reference
Gastrointestinal	Inflammation of gastric squamous mucosa	M: 940 F: 113	F: 457	EPA 1991a, 1991b
	No effect in rats (highest dose)	M: 31.45 F: 34.02		EPA 1992d
	Increased severity of basophilia and hypertrophy of acinar cells in parotid and mandibular salivary gland in rats	100	300	EPA 2015c
	No effect in mice (highest dose)	M: 4,945 F: 6,069		EPA 2015a
Hematological	No effect in rats (highest dose)	M: 940 F: 1,183		EPA 1991a, 1991b
	No effect in rats (highest dose)	M: 31.45 F: 34.02		EPA 1992d
	No effect in rats (highest dose)	M: 1,214 F: 1,498		EPA 2015c
	No effect in rats (highest dose)	1,000		EPA 2015c
	No effect in mice (highest dose)	M: 4,945 F: 6,069		EPA 2015a
	No effect in dogs (highest dose)	500		EPA 1986a, 1987
Hepatic	No effect in rats (highest dose)	M: 940 F: 1,183		EPA 1991a, 1991b
	No effect in rats (highest dose)	M: 31.45 F: 34.02		EPA 1992d
	Increased serum AP, ALT, bilirubin in male rats; increased serum AP, ALT in female rats	M: 361 F: 437	M: 1,214 F: 1,498	EPA 2015c
	No effect in rats	1,000		EPA 2015c
	Centrilobular hepatocellular necrosis in male rats	M: 835 F: 6,069	M: 4,945	EPA 2015a
	No effect in mice (highest dose)	1,000		EPA 2015c
Renal	Increased specific gravity, decreased pH of urine in male rats	M: 362 F: 1,183	M: 940	EPA 1991a, 1991b
	No effect in rats (highest dose)	M: 31.45 F: 34.02		EPA 1992d
	M: Decreased pH of urine in rats M, F: Papillary necrosis in kidney in rats	M: 361 F:437	M: 1,214 F: 1,498	EPA 2015c
	Decreased pH of urine in male rats	M: 300 F: 1,000	M: 1,000	EPA 2015c
	Renal tubular epithelial basophilia in female mice	M: 4,945 F: 968	F: 6,069	EPA 2015a
	No effect in mice (highest dose)	1,000		EPA 2015c

Table A-3. NOAELs and LOAELs Identified in Chronic-Duration Oral Studies of Glyphosate Technical

Endpoint	Effect	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	Reference
Ocular	Lens abnormalities in male rats	M: 362 F: 1,183	M: 940	EPA 1991a, 1991b
	No effect in rats	M: 1,214 F: 1,498		EPA 2015c
	No effect in rats	1,000		EPA 2015c
	No effect in dogs (highest dose)	500		EPA 1986a, 1987
Neurological	No effect in rats (highest dose)	M: 1,214 F: 1,498		EPA 2013c

ALT = alanine aminotransferase; AP = alkaline phosphatase; F = female; LOAEL = lowest-observed-adverse-effect level; M = male; NOAEL = no-observed-adverse-effect level

As shown in Table A-3, gastrointestinal endpoints are the most sensitive to chronic-duration oral exposure of laboratory animals to glyphosate technical. Inflammation of gastric squamous mucosa was observed in female (but not male) rats administered glyphosate technical in the diet for up to 24 months at an estimated dose of 457 mg/kg/day; the NOAEL was 113 mg/kg/day (EPA 1991a, 1991b). Increased severity of cytoplasmic changes in salivary gland cells (basophilia and hypertrophy of acinar cells in parotid and submandibular salivary glands) was reported for rats receiving glyphosate from the diet for 2 years at doses ≥300 mg/kg/day (EPA 2015c). Although salivary gland cytoplasmic changes were noted in rats at doses <300 mg/kg/day as well, the changes were reported to be only of minimal or mild severity; therefore, they are not considered adverse effects. Furthermore, the toxicological significance of the glyphosate treatment-related effects on salivary glands is uncertain. One chronic-duration oral study of male and female mice found no evidence of glyphosate treatment-related gastrointestinal effects at doses as high as 4,945 and 6,069 mg/kg/day, respectively (EPA 1985a, 1985b, 1986b, 1989, 1991c, 1993, 2015a).

Summary of the Principal Study:

EPA. 1991a. June 03, 1991. Memorandum. 40 Page(s). William Dykstra. Toxicology Branch. Glyphosate; 2-Year combined chronic toxicity/carcinogenicity study in Sprague-Dawley rats - List A Pesticide for Reregistration Pages 29-40 removed-registrant data. MRID 416438-01. Tox review 008390. U.S. Environmental Protection Agency. https://archive.epa.gov/pesticides/chemicalsearch/chemical/foia/web/pdf/103601/103601-263.pdf. April 10, 2016.

EPA. 1991b. December 13, 1991. Memorandum. 38 Page(s). William Dykstra. Toxicology Branch I. Glyphosate - EPA Registration No. 524-308 - 2-Year chronic feeding/oncogenicity study in rats with technical glyphosate. MRID 416438-01. Tox review 008897. U.S. Environmental Protection Agency. https://archive.epa.gov/pesticides/chemicalsearch/chemical/foia/web/pdf/103601/103601-268.pdf. April 10, 2016.

Groups of albino Sprague Dawley rats (60/sex/group) were administered technical glyphosate (96.5% purity) in the diet at target concentrations of 0, 2,000, 8,000, or 20,000 ppm (mean measured concentrations of 0, 1,900, 7,600, and 19,000 ppm, respectively) for up to 24 months. Rats were monitored for survival, clinical signs, food intake, and body weight. Ten rats/sex/dose were subjected to

comprehensive evaluations at 12-month interim sacrifice. Rats were subjected to ophthalmologic examinations prior to the initiation of treatment and twice prior to scheduled terminal sacrifice. Blood and urine samples were collected at 6, 12, 18, and 24 months for hematology, clinical chemistry, and urinalysis. Evaluations of all rats that died or survived until scheduled sacrifice included organ weight determinations (brain, liver, kidneys, testes, epididymides, prostate) and comprehensive gross and histopathologic examinations.

There were no indications of glyphosate-related clinical signs or effects on survival. Mean body weights of all glyphosate-treated male rats were not significantly different from that of controls. Mean body weights and of high-dose female rats were significantly lower than that of controls at weeks 7, 13, 81, and 104 (approximately 3–4% less than that of controls); by week 81, the magnitude of the mean body weight difference between high-dose females and their controls reached 13% (470.6 g versus 543.2 g for controls). There were no significant differences between controls and glyphosate-treated groups regarding food consumption. Based on mean body weight and food consumption data, estimated glyphosate doses to controls and low-, mid-, and high-dose groups were 0, 89, 362, and 940 mg/kg/day, respectively, for the males and 0, 113, 457, and 1,183 mg/kg/day, respectively, for the females.

Glyphosate treatment-related nonneoplastic effects included increased incidence of ocular effects (lens abnormalities), renal effects (increased specific gravity and decreased pH of urine) in high-dose (940 mg/kg/day) male rats, and significantly increased incidence of inflammation of gastric squamous mucosa in female rats at 457 and 1,183 mg/kg/day (incidences of 0/59, 3/60, 9/60 [p=0.0015], and 6/59 [p=0.014] among controls, low-, mid-, and high-dose groups, respectively; statistical significance determined using Fisher's exact test). The high-dose (1,183 mg/kg/day) group of female rats exhibited as much as 13% lower mean body weight at treatment week 81. Relative liver weight was significantly increased in high-dose male rats evaluated at 12 months and terminal sacrifice (13–14% greater than controls); however, histopathologic examinations of liver sections revealed no evidence of significant treatment-related nonneoplastic effects.

Selection of the Point of Departure: A chronic-duration oral MRL can be derived for glyphosate-based on incidences of female rats exhibiting gastric lesions in the 2-year dietary study of rats (EPA 1991a, 1991b). Incidences of female rats with gastric lesions were 0/59, 3/60, 9/60, and 6/59 for controls, low-, mid-, and high-dose groups, respectively. All dichotomous models in the Benchmark Dose Modeling Software (BMDS; Version 2.6) were fit to the incidence data for female rats exhibiting inflammation of gastric squamous mucosa. A benchmark response (BMR) of 10% extra risk was applied. None of the models produced adequate fit to the dataset, likely due to 33% lower incidence for the gastric lesion in the high-dose group compared to the mid-dose group. Therefore, a NOAEL/LOAEL approach was employed to derive a chronic-duration oral MRL for glyphosate. The point of departure is the NOAEL of 113 mg/kg/day for gastrointestinal lesions in the female rats of the 2-year dietary study (EPA 1991a, 1991b).

Uncertainty Factor: The NOAEL of 113 mg/kg/day was divided by a total uncertainty factor of 100:

- 10 for animal to human extrapolation
- 10 for human variability

Per ATSDR guidance, MRLs are expressed to one significant figure, making the MRL 1 mg/kg/day.

The glyphosate-induced cytoplasmic changes in salivary glands of the chronically-treated rats were not considered for MRL derivation because the toxicological significance of the changes is uncertain. However, consideration of the NOAEL of 113 mg/kg/day (EPA 2015c) as a point of departure, application of a total uncertainty factor of 100 (10 for extrapolation from animals to humans and 10 for human variability) would also result in a chronic-duration oral MRL of 1 mg/kg/day.

Other Additional Studies or Pertinent Information: Glyphosate-induced gastrointestinal effects were observed in acute-duration oral studies of rats and rabbits (Adam et al. 1997; EPA 1992e, 2013c, 2017b), intermediate-duration oral studies of rats, mice, and rabbits (EPA 1992a, 1992f; NTP 1992), and chronic-duration oral studies of rats (EPA 1991a, 1991b, 2015c).

Agency Contact (Chemical Manager): Hana R. Pohl, M.D., Ph.D.

APPENDIX B. LITERATURE SEARCH FRAMEWORK FOR GLYPHOSATE

The objective of the toxicological profile is to evaluate the potential for human exposure and the potential health hazards associated with inhalation, oral, or dermal/ocular exposure to glyphosate.

B.1 LITERATURE SEARCH AND SCREEN

A literature search and screen was conducted to identify studies examining health effects, toxicokinetics, mechanisms of action, susceptible populations, biomarkers, chemical interactions, physical and chemical properties, production, use, environmental fate, environmental releases, and environmental and biological monitoring data for glyphosate. ATSDR primarily focused on peer-reviewed articles without publication date or language restrictions. Non-peer-reviewed studies that were considered relevant to the assessment of the health effects of glyphosate have undergone peer review by at least three ATSDR-selected experts who have been screened for conflict of interest. The inclusion criteria used to identify relevant studies examining the health effects of glyphosate are presented in Table B-1.

Table B-1. Inclusion Criteria for the Literature Search and Screen

- Health Effects
  - Species
    - Human
    - Laboratory mammals
  - Route of exposure
    - Inhalation
    - Oral
    - Dermal (or ocular)
    - Parenteral (these studies will be considered supporting data)
  - Health outcome
    - Death
    - Systemic effects
    - Body weight effects
    - Respiratory effects
    - Cardiovascular effects
    - Gastrointestinal effects
    - Hematological effects
    - Musculoskeletal effects
    - Hepatic effects
    - Renal effects
    - Dermal effects
    - Ocular effects
    - Endocrine effects
    - Immunological effects
    - Neurological effects
    - Reproductive effects
    - Developmental effects

Table B-1. Inclusion Criteria for the Literature Search and Screen

	Other noncancer effects
	Cancer
Toxicokinetics	
	Absorption
	Distribution
	Metabolism
	Excretion
	PBPK models
Biomarkers	
	Biomarkers of exposure
	Biomarkers of effect
Interactions with other chemicals	
Potential for human exposure	
	Releases to the environment
	Air
	Water
	Soil
	Environmental fate
	Transport and partitioning
	Transformation and degradation
	Environmental monitoring
	Air
	Water
	Sediment and soil
	Other media
	Biomonitoring
	General populations
	Occupation populations

B.1.1 Literature Search

The following main databases were searched in February 2015 and September 2017:

- PubMed
- National Library of Medicine's TOXLINE
- Scientific and Technical Information Network's TOXCENTER

The search strategy used the chemical names, Chemical Abstracts Service (CAS) numbers, synonyms, and Medical Subject Headings (MeSH) terms for glyphosate. The query strings used for the literature search are presented in Table B-2.

The search was augmented by searching the Toxic Substances Control Act Test Submissions (TSCATS), NTP website, and National Institute of Health Research Portfolio Online Reporting Tools Expenditures and Results (NIH RePORTER) databases using the queries presented in Table B-3. Additional databases

were searched in the creation of various tables and figures, such as the TRI Explorer, the Substance Priority List (SPL) resource page, and other items as needed. Regulations applicable to glyphosate were identified by searching international and U.S. agency websites and documents.

Review articles were identified and used for the purpose of providing background information and identifying additional references. ATSDR also identified reports from the grey literature, which included unpublished research reports, technical reports from government agencies, conference proceedings and abstracts, and theses and dissertations. The reference sections of the gray literature were used as quality assurance (QA) to ensure that no studies were missed during the literature review process. The ToxProfiles rely on peer reviewed data such as published studies and reports from government agencies or international organizations. In certain cases (e.g. ATSDR's use of EPA's DERs), ATSDR will rely on peer reviewed studies and reports evaluating unpublished data or original studies that are not available to ATSDR.

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
PubMed 9/2017	("glyphosate"[nm] OR "1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw] OR "Roundup"[tw] OR "34494-03-6"[tw] OR "MON 0459"[tw] OR "40465-66-5"[tw] OR "MON 14420"[tw] OR "MON 8750"[tw] OR "Roundup Hi-Load"[tw] OR "Roundup PRODry"[tw] OR "70393-85-0"[tw] OR "MON 8000"[tw] OR "Monsanto 8000"[tw] OR "Polado"[tw] OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate"[tw] OR "39600-42-5"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate monopotassium salt"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate-potassium"[tw] OR "Monopotassium glyphosate"[tw] OR "Roundup Attack"[tw] OR "Roundup Energy"[tw] OR "Roundup Maxload"[tw] OR "Roundup Original Max"[tw] OR "Roundup Power Max"[tw] OR "Roundup Ultramax II"[tw] OR "Roundup Weathermax"[tw] OR "Touchdown Forte HiTech"[tw] OR "Transorb R"[tw] OR "Weathermax"[tw] OR "Zapp Qi"[tw] OR "70901-12-1"[tw] OR "Glyphosate-potassium"[tw] OR "Potassium glyphosate"[tw] OR "Potassium N-(phosphonomethyl)glycine"[tw] OR "Uragan Forte"[tw] OR "VisionMAX"[tw] OR "N-(phosphonomethyl)glycine potassium salt"[tw] OR "114370-14-8"[tw] OR "Glyphosate ammonium"[tw] OR "N-(phosphonomethyl)glycine ammonium salt"[tw] OR "69254-40-6"[tw] OR "Glyphosate-diammonium"[tw] OR "Diammonium N-(phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)glycine diammonium salt"[tw]) AND (cancer[sb] OR "neoplasms"[mh] OR "carcinogenicity tests"[mh] OR "carcinogens"[mh] OR "cell division/drug effects"[mh] OR "cell cycle/drug effects"[mh] OR "cell line, tumor/drug effects"[mh] OR "gene expression regulation, neoplastic"[mh] OR "neoplasm proteins/drug effects"[mh] OR "angiogenesis inducing agents"[mh] OR "myelodysplastic-myeloproliferative diseases"[mh] OR cancer*[tw] OR carcinog*[tw] OR carcinom*[tw] OR cocarcinog*[tw] OR lymphoma*[tw] OR neoplas*[tw] OR oncogen*[tw] OR precancer*[tw] OR tumor*[tw] OR tumour*[tw]) AND

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	(2014/02/01 : 3000[dp] OR 2015/02/01 : 3000[mhda] OR 2015/02/01 : 3000[crdat] OR 2015/02/01 : 3000[edat])
	("glyphosate, isopropyl amine salt"[nm] OR "N-(phosphonomethyl)glycine trimethylsulfonium salt"[nm] OR "38641-94-0"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Azural AT"[tw] OR "CP 70139"[tw] OR "Fosulen"[tw] OR "Glifosato estrella"[tw] OR "Glycel"[tw] OR "Glycine, N-(phosphonomethyl)-, cmpd with 2-propanamine (1:1)"[tw] OR "Glyfos AU"[tw] OR "Glyfos BIO"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Glyphosate mono(isopropylamine) salt"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate-mono(isopropylammonium)"[tw] OR "Landmaster"[tw] OR "MON 139"[tw] OR "MON 39"[tw] OR "N-(Phosphonomethyl)glycine isopropylamine salt"[tw] OR "N-(Phosphonomethyl)glycine isopropylammonium salt"[tw] OR "N-(Phosphonomethyl)glycine monoisopropylamine salt"[tw] OR "Nitosorg"[tw] OR "Ron-do"[tw] OR "Utal"[tw] OR "Utal (herbicide)"[tw] OR "Vision (herbicide)"[tw] OR "2-Propanamine, compd, with N-(phosphonomethyl)glycine (1:1)"[tw] OR "Glycine, N-(phosphonomethyl)-, compd. with 2-propanamine (1:1)"[tw] OR "N-(Phosphonomethyl)glycine, compound with 2-propylamine (1:1)"[tw] OR "Isopropylamine glyphosate"[tw] OR "81591-81-3"[tw] OR "Glyphosate-trimesium"[tw] OR "Glyphosphate-trimesium"[tw] OR "Avans 330"[tw] OR "Glyphosate mono(trimethylsulfonium) salt"[tw] OR "Glyphosate trimethylsulfonium salt"[tw] OR "Glyphosate-trimesium"[tw] OR "Medallon"[tw] OR "Ouragan"[tw] OR "R 50224"[tw] OR "SC 0224"[tw] OR "Sulfosate"[tw] OR "Sulphosate"[tw] OR "Touchdown herbicide"[tw] OR "Trimethylsulfonium carboxymethylamino-methylphosphonate"[tw] OR "Trimethylsulfonium glyphosate"[tw] OR "Glycine, N-(phosphonomethyl)-, ion(1-), trimethylsulfonium"[tw] OR "Sulfosate"[tw]) AND (cancer[sb] OR "neoplasms"[mh] OR "carcinogenicity tests"[mh] OR "carcinogens"[mh] OR "cell division/drug effects"[mh] OR "cell cycle/drug effects"[mh] OR "cell line, tumor/drug effects"[mh] OR "gene expression regulation, neoplastic"[mh] OR "neoplasm proteins/drug effects"[mh] OR "angiogenesis inducing agents"[mh] OR "myelodysplastic-myeloproliferative diseases"[mh] OR cancer*[tw] OR carcinog*[tw] OR carcinom*[tw] OR cocarcinog*[tw] OR lymphoma*[tw] OR neoplas*[tw] OR oncogen*[tw] OR precancer*[tw] OR tumor*[tw] OR tumour*[tw]) AND (2014/02/01 : 3000[dp] OR 2015/02/01 : 3000[mhda] OR 2015/02/01 : 3000[crdat] OR 2015/02/01 : 3000[edat])
2/2015	("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb])
	("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw])) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	"peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb])) ("34494-03-6"[tw] OR "MON 0459"[tw] OR "40465-66-5"[tw] OR "MON 14420"[tw] OR "MON 8750"[tw] OR "Roundup Hi-Load"[tw] OR "Roundup PRODry"[tw] OR "70393-85-0"[tw] OR "MON 8000"[tw] OR "Monsanto 8000"[tw] OR "Polado"[tw] OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr]) ("39600-42-5"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate monopotassium salt"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate-potassium"[tw] OR "Monopotassium glyphosate"[tw] OR "Roundup Attack"[tw] OR "Roundup Energy"[tw] OR "Roundup Maxload"[tw] OR "Roundup Original Max"[tw] OR "Roundup Power Max"[tw] OR "Roundup Ultramax II"[tw] OR "Roundup Weathermax"[tw] OR "Touchdown Forte HiTech"[tw] OR "Transorb R"[tw] OR "Weathermax"[tw] OR "Zapp Qi"[tw] OR "70901-12-1"[tw] OR "Glyphosate-potassium"[tw] OR "Potassium glyphosate"[tw] OR "Potassium N-(phosphonomethyl)glycine"[tw] OR "Uragan Forte"[tw] OR "VisionMAX"[tw] OR "N-(phosphonomethyl)glycine potassium salt"[tw] OR "114370-14-8"[tw] OR "Glyphosate ammonium"[tw] OR "N-(phosphonomethyl)glycine ammonium salt"[tw] OR "69254-40-6"[tw] OR "Glyphosate-diammonium"[tw] OR "Diammonium N-(phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)glycine diammonium salt"[tw]) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	"Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb]) OR ("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw]))) (((("glyphosate, isopropyl amine salt"[nm]) OR ("N-(phosphonomethyl)glycine trimethylsulfonium salt"[nm])) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb]) OR ("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw])))) OR (("38641-94-0"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Azural AT"[tw] OR "CP 70139"[tw] OR "Fosulen"[tw] OR "Glifosato estrella"[tw] OR "Glycel"[tw] OR "Glycine, N-(phosphonomethyl)-, cmpd with 2-propanamine (1:1)"[tw] OR "Glyfos AU"[tw] OR "Glyfos BIO"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Glyphosate mono(isopropylamine) salt"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate-mono(isopropylammonium)"[tw] OR "Landmaster"[tw] OR "MON 139"[tw] OR "MON 39"[tw] OR "N-(Phosphonomethyl)glycine isopropylamine salt"[tw] OR "N-(Phosphonomethyl)glycine isopropylammonium salt"[tw] OR "N-(Phosphonomethyl)glycine monoisopropylamine salt"[tw] OR "Nitosorg"[tw] OR "Ron-do"[tw] OR "Utal"[tw] OR "Utal (herbicide)"[tw] OR "Vision (herbicide)"[tw] OR "2-Propanamine, compd, with N-

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	(phosphonomethyl)glycine (1:1)"[tw] OR "Glycine, N-(phosphonomethyl)-, compd. with 2-propanamine (1:1)"[tw] OR "N-(Phosphonomethyl)glycine, compound with 2-propylamine (1:1)"[tw] OR "Isopropylamine glyphosate"[tw] OR "81591-81-3"[tw] OR "Glyphosate-trimesium"[tw] OR "Glyphosphate-trimesium"[tw] OR "Avans 330"[tw] OR "Glyphosate mono(trimethylsulfonium) salt"[tw] OR "Glyphosate trimethylsulfonium salt"[tw] OR "Glyphosate-trimesium"[tw] OR "Medallon"[tw] OR "Ouragan"[tw] OR "R 50224"[tw] OR "SC 0224"[tw] OR "Sulfosate"[tw] OR "Sulphosate"[tw] OR "Touchdown herbicide"[tw] OR "Trimethylsulfonium carboxymethylamino-methylphosphonate"[tw] OR "Trimethylsulfonium glyphosate"[tw] OR "Glycine, N-(phosphonomethyl)-, ion(1-), trimethylsulfonium"[tw] OR "Sulfosate"[tw]) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb]) OR ("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw]))))
Toxline 9/2017	("lancer herbicide" OR "mon 2139" OR "mon 3539" OR "mon 6000" OR "phorsat" OR "phosphonomethyliminoacetic acid" OR "rebel garden" OR "roundup max" OR "safal" OR "scout herbicide") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	(" (carboxymethylamino) methylphosphonic acid" OR "carboxymethylaminomethanephosphinic acid" OR "c k yuyos fav" OR "cp 67573" OR "folusen" OR "forsat" OR "glialka" OR "glifosan 747" OR "glygran" OR "glyphodin a" OR "glyphomax" OR "ground bio" OR "herbatop" OR "hm 2028" OR "kickdown") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("glifoglex" OR "gliphosate" OR "gliz" OR "glyfos" OR "glyphosate" OR "glyphosphate" OR "n (phosphonomethyl) glycine" OR "n (phosphonomethyl) glycine" OR "n phosphomethylglycine" OR "n phosphonomethylglycine" OR "phosphonomethylglycine" OR "pondmaster" OR "silglif" OR "yerbimat") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	1071-83-6 [rn] AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) [not] PubMed [org] [not] pubdart [org] (#7 NOT #4) AND NOT PubMed [org] AND NOT pubdart [org]
	"roundup" AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) [not] PubMed [org] [not] pubdart [org]
	("mon 0459" OR "40465 66 5" OR "mon 14420" OR "mon 8750" OR "roundup hi load" OR "roundup prodry" OR "mon 8000" OR "monsanto 8000" OR "polado" OR "trisodium hydrogen bis (n (phosphonatomethyl) aminoacetate) ") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	(34494-03-6 [rn] OR 70393-85-0 [rn]) AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org]

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("glyphosate diammonium" OR "diammonium n (phosphonomethyl) glycine" OR "n (phosphonomethyl) glycine diammonium salt") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("roundup weathermax" OR "touchdown forte hitech" OR "transorb r" OR "weathermax" OR "zapp qi" OR "glyphosate potassium" OR "potassium glyphosate" OR "potassium n (phosphonomethyl) glycine" OR "uragan forte" OR "visionmax" OR "n (phosphonomethyl) glycine potassium salt" OR "glyphosate ammonium" OR "n (phosphonomethyl) glycine ammonium salt") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("glyphosate potassium" OR "glyphosate monopotassium salt" OR "glyphosate potassium" OR "glyphosate potassium" OR "monopotassium glyphosate" OR "roundup attack" OR "roundup energy" OR "roundup maxload" OR "roundup original max" OR "roundup power max" OR "roundup ultramax ii") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	(39600-42-5 [rn] OR 39600-55-0 [rn] OR 39600-56-1 [rn] OR 39600-58-3 [rn] OR 40465-59-6 [rn] OR 40465-64-3 [rn] OR 40465-67-6 [rn] OR 40465-70-1 [rn] OR 40465-90-5 [rn] OR 40465-91-6 [rn] OR 70901-12-1 [rn] OR 114370-14-8 [rn] OR 69254-40-6 [rn]) AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("sulphosate" OR "touchdown herbicide" OR "trimethylsulfonium carboxymethylamino methylphosphonate" OR "trimethylsulfonium glyphosate" OR "glycine n (phosphonomethyl) ion (1) trimethylsulfonium") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("isopropylamine glyphosate" OR "glyphosate trimesium" OR "glyphosphate trimesium" OR "avans 330" OR "glyphosate mono (trimethylsulfonium) salt" OR "glyphosate trimethylsulfonium salt" OR "glyphosate trimesium" OR "medallon" OR "ouragan" OR "r 50224" OR "sc 0224" OR "sulfosate") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	("n (phosphonomethyl) glycine monoisopropylamine salt" OR "nitosorg" OR "utal" OR "utal (herbicide) " OR "vision (herbicide) " OR "2 propanamine compd with n (phosphonomethyl) glycine (1 1) " OR "glycine n (phosphonomethyl) compd with 2 propanamine (1 1) " OR "n (phosphonomethyl) glycine compound with 2 propylamine (1 1) ") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("glyphosate mono (isopropylamine) salt" OR "glyphosate isopropylammonium" OR "glyphosate mono (isopropylammonium) " OR "landmaster" OR "mon 139" OR "mon 39" OR "n (phosphonomethyl) glycine isopropylamine salt" OR "n (phosphonomethyl) glycine isopropylammonium salt") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	("glyphosate isopropylammonium" OR "glyphosate isopropylamine salt" OR "azural at" OR "cp 70139" OR "fosulen" OR "glifosato estrella" OR "glycel" OR "glycine n (phosphonomethyl) cmpd with 2 propanamine (1 1) " OR "glyfos au" OR "glyfos bio" OR "glyphosate isopropylamine salt") AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
	(38641-94-0 [rn] OR 81591-81-3 [rn]) AND 2014:2017 [yr] AND (ANEUPL [org] OR BIOSIS [org] OR CIS [org] OR DART [org] OR EMIC [org] OR EPIDEM [org] OR FEDRIP [org] OR HEEP [org] OR HMTC [org] OR IPA [org] OR RISKLINE [org] OR MTGABS [org] OR NIOSH [org] OR NTIS [org] OR PESTAB [org] OR PPBIB [org]) AND NOT PubMed [org] AND NOT pubdart [org]
2/2015	"Glifoglex" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "Glyphosate" OR "Glyphosphate" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phosphonomethylglycine" OR "Pondmaster" OR "Silglif" OR "yerbimat"
	"(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifosan 747" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown"
	"Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "Phorsat" OR "Phosphonomethyliminoacetic acid" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide"
	"roundup"
	34494-03-6[rn] OR 70393-85-0[rn]
	"MON 0459" OR "40465-66-5" OR "MON 14420" OR "MON 8750" OR "Roundup Hi-Load" OR "Roundup PRODry" OR "MON 8000" OR "Monsanto 8000" OR "Polado" OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate)"

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	39600-42-5[rn] OR 39600-55-0[rn] OR 39600-56-1[rn] OR 39600-58-3[rn] OR 40465-59-6[rn] OR 40465-64-3[rn] OR 40465-67-6[rn] OR 40465-70-1[rn] OR 40465-90-5[rn] OR 40465-91-6[rn] OR 70901-12-1[rn] OR 114370-14-8[rn] OR 69254-40-6[rn]
	"Glyphosate potassium" OR "Glyphosate monopotassium salt" OR "Glyphosate potassium" OR "Glyphosate-potassium" OR "Monopotassium glyphosate" OR "Roundup Attack" OR "Roundup Energy" OR "Roundup Maxload" OR "Roundup Original Max" OR "Roundup Power Max" OR "Roundup Ultramax II"
	"Roundup Weathermax" OR "Touchdown Forte HiTech" OR "Transorb R" OR "Weathermax" OR "Zapp Qi" OR "Glyphosate-potassium" OR "Potassium glyphosate" OR "Potassium N-(phosphonomethyl)glycine" OR "Uragan Forte" OR "VisionMAX" OR "N-(phosphonomethyl)glycine potassium salt" OR "Glyphosate ammonium" OR "N-(phosphonomethyl)glycine ammonium salt"
	"Glyphosate-diammonium" OR "Diammonium N-(phosphonomethyl)glycine" OR "N-(phosphonomethyl)glycine diammonium salt"
	38641-94-0[rn] OR 81591-81-3[rn]
	"Glyphosate-isopropylammonium" OR "Glyphosate isopropylamine salt" OR "Azural AT" OR "CP 70139" OR "Fosulen" OR "Glifosato estrella" OR "Glycel" OR "Glycine, N-(phosphonomethyl)-, cmpd with 2-propanamine (1:1)" OR "Glyfos AU" OR "Glyfos BIO" OR "Glyphosate isopropylamine salt"
	"Glyphosate mono(isopropylamine) salt" OR "Glyphosate-isopropylammonium" OR "Glyphosate-mono(isopropylammonium)" OR "Landmaster" OR "MON 139" OR "MON 39" OR "N-(Phosphonomethyl)glycine isopropylamine salt" OR "N-(Phosphonomethyl)glycine isopropylammonium salt"
	"N-(Phosphonomethyl)glycine monoisopropylamine salt" OR "Nitosorg" OR "Utal" OR "Utal (herbicide)" OR "Vision (herbicide)" OR "2-Propanamine, compd, with N-(phosphonomethyl)glycine (1:1)" OR "Glycine, N-(phosphonomethyl)-, compd. with 2-propanamine (1:1)" OR "N-(Phosphonomethyl)glycine, compound with 2-propylamine (1:1)"
	"Isopropylamine glyphosate" OR "Glyphosate-trimesium" OR "Glyphosphate-trimesium" OR "Avans 330" OR "Glyphosate mono(trimethylsulfonium) salt" OR "Glyphosate trimethylsulfonium salt" OR "Glyphosate-trimesium" OR "Medallon" OR "Ouragan" OR "R 50224" OR "SC 0224" OR "Sulfosate"
	"Sulphosate" OR "Touchdown herbicide" OR "Trimethylsulfonium carboxymethylamino-methylphosphonate" OR "Trimethylsulfonium glyphosate" OR "Glycine, N- N-phosphonemethyl)-, ion(1-), trimethylsulfonium"
Toxcenter 9/2017	L1 9995 SEA 1071-83-6 L2 92 SEA 34494-03-6 OR 40465-66-5 OR 70393-85-0 L3 80 SEA 39600-42-5 OR 39600-55-0 OR 39600-56-1 OR 39600-58-3 OR 40465-59-6 OR 40465-64-3 OR 40465-67-6 OR 40465-70-1 OR 40465-90-5 OR 40465-91-6 L4 101 SEA 70901-12-1 OR 114370-14-8 OR 69254-40-6 L5 2022 SEA 38641-94-0 OR 81591-81-3 L6 10037 SEA L1 OR L2 OR L3 OR L4 L7 6132 SEA L6 NOT (TSCATS/FS OR PATENT/DT) L8 2048 SEA L6 AND (PY>2013 OR ED>=20150201) L9 1260 SEA L7 AND (PY>2013 OR ED>=20150201) L10 751 SEA L5 NOT L6

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	L11 530 SEA L10 NOT (TSCATS/FS OR PATENT/DT) L12 63 SEA L11 AND (PY>2013 OR ED>=20150201) L13 56 SEA L9 AND (CANCER? OR CARCINOG? OR CARCINOM? OR COCARCINOG? OR LYMPHOMA? OR NEOPLAS? OR ONCOGEN? OR PRECANCER? OR TUMOR? OR TUMOUR?) L14 6 SEA L12 AND (CANCER? OR CARCINOG? OR CARCINOM? OR COCARCINOG? OR LYMPHOMA? OR NEOPLAS? OR ONCOGEN? OR PRECANCER? OR TUMOR? OR TUMOUR?) L15 16 SEA L13 AND MEDLINE/FS L16 40 SEA L13 NOT L15 L17 44 DUP REM L15 L16 (12 DUPLICATES REMOVED) ANSWERS '1-44' FROM FILE TOXCENTER L*** DEL 16 S L13 AND MEDLINE/FS L*** DEL 16 S L13 AND MEDLINE/FS L18 16 SEA L17 L*** DEL 40 S L13 NOT L15 L*** DEL 40 S L13 NOT L15 L19 28 SEA L17 L20 28 SEA (L18 OR L19) NOT MEDLINE/FS D SCAN L20 L21 401072 SEA 14 NOT MEDLINE/FS L22 6 SEA L14 NOT MEDLINE/FS L23 6 DUP REM L22 (0 DUPLICATES REMOVED) ANSWERS '1-6' FROM FILE TOXCENTER D SCAN L23 FILE 'MEDLINE' ENTERED AT 19:10:42 ON 14 SEP 2017 CHARGED TO COST=EH011.10.01 L24 QUE ACROCHORDON OR ACROCHORDONS OR ADENOMATOSIS OR ADENOMATOUS OR ADENOSIS OR AMYLOIDOSES OR AMYLOIDOSIS OR ANAPLASIA OR ANGIOENDOTHELIOMATOSIS OR ANGIOMATOSIS OR BUSCHKE-LOWENSTEIN OR CANCER OR CANCEROUS OR CANCERS OR CARCINOGEN L25 QUE CARCINOGENESIS OR CARCINOGENIC OR CARCINOGENICITY OR CARCINOGENS OR CARCINOID OR CARCINOMATOSIS OR CHERUBISM OR CIN OR CLL OR COCARCINOGENESIS OR DERMOID OR DYSMYELOPOIESIS OR ENCHONDROMATOSIS OR EPIDERMOID OR ERYTHROLEUKAEMIA OR ERYTHROLE UKAEMIAS L26 QUE ERYTHROLEUKEMIA OR ERYTHROLEUKEMIAS OR ERYTHROPLAKIA OR ERYTHROPLAKIAS OR ERYTHROPLASIA OR ESSENTIAL-THROMBOCYTHEMIA OR EXOSTOSIS OR FIBROADENOSIS OR FIBROID OR FIBROIDS OR

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	FIBROMATOSIS OR GLIOMATOSIS OR GLOMANGIOMATOSIS OR GRANULOMATOS
	IS
	L27 QUE GYNAECOMASTIA OR GYNECOMASTIA OR HEMANGIOMATOSIS OR
	HODGKIN OR HODGKINS OR LEIOMYOMATOSIS OR LEUKAEMIA OR LEUKAEMIA
	S OR LEUKEMIA OR LEUKEMIAS OR LEUKOPLAKIA OR LEUKOPLAKIAS OR
	LEUKOSTASIS OR LIPOBLASTOMATOSIS OR LIPOMATOSIS
	L28 QUE LYMPHANGIOLEIOMYOMATOSIS OR LYMPHANGIOMATOSIS OR LYMPHANGIO
	MYOMATOSIS OR LYMPHOPROLIFERATION OR LYMPHOPROLIFERATIONS OR
	LYMPHOPROLIFERATIVE OR LYMPHOSCINTIGRAPHIC OR LYMPHOSCINTIGRAPH
	Y OR MACROGLOBULINEMIA OR MACROGLOBULINEMIAS
	L29 QUE MALIGNANCIES OR MALIGNANCY OR MALIGNANT OR MASTOCYTOSIS OR
	MEIGS-SYNDROME OR MELANOMATOSIS OR MENINGIOMATOSIS OR METAPLASI
	A OR MICROMETASTASES OR MICROMETASTASIS OR MYCOSIS-FUNGOIDES
	OR MYELODYSPLASIA OR MYELODYSPLASIAS
	L30 QUE MYELODYSPLASTIC OR MYELOFIBROSIS OR MYELOMATOSIS OR
	MYELOPROLIFERATION OR MYELOPROLIFERATIONS OR MYELOPROLIFERATIVE
	OR MYELOSUPPRESSION OR MYOFIBROMATOSIS OR NEOPLASIA OR
	NEOPLASM OR NEOPLASMS OR NEOPLASTIC OR NEURILEMMOMATOSIS
	L31 QUE NEUROFIBROMATOSIS OR NEURONEVUS OR NONHODGKIN OR NONHODGKIN
	S OR NONSEMINOMATOUS OR NSCLC OR ONCOGENE-FUSION OR OPSOCLONUS-
	MYOCLONUS OR PAPILLOMATA OR PAPILLOMATOSIS OR PARANEOPLASTIC
	OR PEUTZ-JEGHERS OR POLYPOSIS OR PRECANCER
	L32 QUE PRECANCEROUS OR SARCOMATOSIS OR SCHWANNOMATOSIS OR
	SEMINOMATOUS OR SEZARY-SYNDROME OR STRUMA-OVARII OR TUMOR OR
	TUMORGENESIS OR TUMORGENIC OR TUMORIGENESIS OR TUMORIGENIC OR
	TUMOR-MARKER OR TUMOR-MARKERS OR TUMOROGENESIS
	L33 QUE TUMOROGENIC OR TUMORS OR TUMOUR OR TUMOURS OR WALDENSTROM
	OR WALDENSTROMS OR "5Q-SYNDROME" OR "WAGR SYNDROME" OR (ASCO
	NOT FUNGI) OR (SENTINEL-LYMPH-NODE NOT BIOPSY)
	L34 QUE L24 OR L25 OR L26 OR L27 OR L28 OR L29 OR L30 OR L31 OR L32 OR L33

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	DIS COST FILE 'TOXCENTER' ENTERED AT 19:12:52 ON 14 SEP 2017 CHARGED TO COST=EH011.10.01 L47 1 SEA L9 AND ?IOMA DIS COST L48 26 SEA L9 AND (?AOMA OR ?BOMA OR ?COMA OR ?DOMA OR ?EOMA OR ?FOMA OR ?GOMA OR ?HOMA OR ?IOMA OR ?JOMA OR ?KOMA OR ?LOMA OR ?MOMA OR ?NOMA OR ?OOMA OR ?POMA OR ?QOMA OR ?ROMA OR ?SOMA OR ?TOMA OR ?UOMA OR ?VOMA OR ?WOMA) L49 0 SEA L9 AND (?XOMA OR ?YOMA OR ?ZOMA OR ?AOMAS OR ?BOMAS OR ?COMAS OR ?DOMAS OR ?EOMAS OR ?FOMAS OR ?GOMAS OR ?HOMAS OR ?IOMAS OR ?JOMAS OR ?KOMAS OR ?LOMAS OR ?MOMAS OR ?NOMAS OR ?OOMAS OR ?POMAS OR ?QOMAS OR ?ROMAS) L50 0 SEA L9 AND (?SOMAS OR ?TOMAS OR ?UOMAS OR ?VOMAS OR ?WOMAS OR ?XOMAS OR ?YOMAS OR ?ZOMAS) L51 48 SEA L9 AND L34 L52 68 SEA L48 OR L49 OR L50 OR L51 L53 16 SEA L52 NOT L13 L54 20 SEA L52 AND MEDLINE/FS L55 7 SEA L53 AND MEDLINE/FS L56 12 DUP REM L53 (4 DUPLICATES REMOVED) ANSWERS '1-12' FROM FILE TOXCENTER D SCAN L56 L57 6 SEA L12 AND L34 L58 2 SEA L12 AND (?AOMA OR ?BOMA OR ?COMA OR ?DOMA OR ?EOMA OR ?FOMA OR ?GOMA OR ?HOMA OR ?IOMA OR ?JOMA OR ?KOMA OR ?LOMA OR ?MOMA OR ?NOMA OR ?OOMA OR ?POMA OR ?QOMA OR ?ROMA OR ?SOMA OR ?TOMA OR ?UOMA OR ?VOMA OR ?WOMA) L59 0 SEA L12 AND (?XOMA OR ?YOMA OR ?ZOMA OR ?AOMAS OR ?BOMAS OR ?COMAS OR ?DOMAS OR ?EOMAS OR ?FOMAS OR ?GOMAS OR ?HOMAS OR ?IOMAS OR ?JOMAS OR ?KOMAS OR ?LOMAS OR ?MOMAS OR ?NOMAS OR ?OOMAS OR ?POMAS OR ?QOMAS OR ?ROMAS) L60 0 SEA L12 AND (?SOMAS OR ?TOMAS OR ?UOMAS OR ?VOMAS OR ?WOMAS OR ?XOMAS OR ?YOMAS OR ?ZOMAS) L61 8 SEA L57 OR L58 L62 8 SEA L61 NOT (L13 OR L52) L63 7 DUP REM L62 (1 DUPLICATE REMOVED)

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	ANSWERS '1-7' FROM FILE TOXCENTER D SCAN L63
2/2017	FILE 'TOXCENTER' ENTERED AT 19:21:56 ON 18 FEB 2015 CHARGED TO COST=EH011.05.01.01 L1 8342 SEA 1071-83-6 L2 63 SEA 34494-03-6 OR 40465-66-5 OR 70393-85-0 L3 8 SEA L2 NOT L1 L4 53 SEA 39600-42-5 OR 39600-55-0 OR 39600-56-1 OR 39600-58-3 OR 40465-59-6 OR 40465-64-3 OR 40465-67-6 OR 40465-70-1 OR 40465-90-5 OR 40465-91-6 L5 59 SEA 70901-12-1 OR 114370-14-8 OR 69254-40-6 L6 1828 SEA 38641-94-0 OR 81591-81-3 L7 8369 SEA L1 OR L2 OR L4 OR L5 L8 5041 SEA L7 NOT (PATENT/DT OR TSCATS/FS) ACT TOXQUERY/Q --------- L9 QUE (CHRONIC OR IMMUNOTOX? OR NEUROTOX? OR TOXICOKIN? OR BIOMARKER? OR NEUROLOG?) L10 QUE (PHARMACOKIN? OR SUBCHRONIC OR PBPK OR EPIDEMIOLOGY/ST,CT, IT) L11 QUE (ACUTE OR SUBACUTE OR LD50# OR LD(W)50 OR LC50# OR LC(W)50) L12 QUE (TOXICITY OR ADVERSE OR POISONING)/ST,CT,IT L13 QUE (INHAL? OR PULMON? OR NASAL? OR LUNG? OR RESPIR?) L14 QUE ((OCCUPATION? OR WORKPLACE? OR WORKER?) AND EXPOS?) L15 QUE (ORAL OR ORALLY OR INGEST? OR GAVAGE? OR DIET OR DIETS OR DIETARY OR DRINKING(W)WATER?) L16 QUE (MAXIMUM AND CONCENTRATION? AND (ALLOWABLE OR PERMISSIBLE)) L17 QUE (ABORT? OR ABNORMALIT? OR EMBRYO? OR CLEFT? OR FETUS?) L18 QUE (FOETUS? OR FETAL? OR FOETAL? OR FERTIL? OR MALFORM? OR OVUM?) L19 QUE (OVA OR OVARY OR PLACENTA? OR PREGNAN? OR PRENATAL?) L20 QUE (PERINATAL? OR POSTNATAL? OR REPRODUC? OR STERIL? OR TERATOGEN?) L21 QUE (SPERM OR SPERMAC? OR SPERMAG? OR SPERMATI? OR SPERMAS? OR SPERMATOB? OR SPERMATOC? OR SPERMATOG?) L22 QUE (SPERMATOI? OR SPERMATOL? OR SPERMATOR? OR SPERMATOX? OR SPERMATOZ? OR SPERMATU? OR SPERMI? OR SPERMO?) L23 QUE (NEONAT? OR NEWBORN? OR DEVELOPMENT OR DEVELOPMENTAL?) L24 QUE (ENDOCRIN? AND DISRUPT?) L25 QUE (ZYGOTE? OR CHILD OR CHILDREN OR ADOLESCEN? OR INFANT?) L26 QUE (WEAN? OR OFFSPRING OR AGE(W)FACTOR?)

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	L27 QUE (DERMAL? OR DERMIS OR SKIN OR EPIDERM? OR CUTANEOUS?) L28 QUE (CARCINOG? OR COCARCINOG? OR CANCER? OR PRECANCER? OR NEOPLAS?) L29 QUE (TUMOR? OR TUMOUR? OR ONCOGEN? OR LYMPHOMA? OR CARCINOM?) L30 QUE (GENETOX? OR GENOTOX? OR MUTAGEN? OR GENETIC(W)TOXIC?) L31 QUE (NEPHROTOX? OR HEPATOTOX?) L32 QUE (ENDOCRIN? OR ESTROGEN? OR ANDROGEN? OR HORMON?) L33 QUE (OCCUPATION? OR WORKER? OR WORKPLACE? OR EPIDEM?) L34 QUE L9 OR L10 OR L11 OR L12 OR L13 OR L14 OR L15 OR L16 OR L17 OR L18 OR L19 OR L20 OR L21 OR L22 OR L23 OR L24 OR L25 OR L26 OR L27 OR L28 OR L29 OR L30 OR L31 OR L32 OR L33 L35 QUE (RAT OR RATS OR MOUSE OR MICE OR GUINEA(W)PIG? OR MURIDAE OR DOG OR DOGS OR RABBIT? OR HAMSTER? OR PIG OR PIGS OR SWINE OR PORCINE OR MONKEY? OR MACAQUE?) L36 QUE (MARMOSET? OR FERRET? OR GERBIL? OR RODENT? OR LAGOMORPHA OR BABOON? OR CANINE OR CAT OR CATS OR FELINE OR MURINE) L37 QUE L34 OR L35 OR L36 L38 QUE (HUMAN OR HUMANS OR HOMINIDAE OR MAMMALS OR MAMMAL? OR PRIMATES OR PRIMATE?) L39 QUE L37 OR L38 --------- L40 2675 SEA L8 AND L37 L41 525 SEA L40 AND MEDLINE/FS L42 833 SEA L40 AND BIOSIS/FS L43 1263 SEA L40 AND CAPLUS/FS L44 0 SEA L40 AND IPA/FS L45 54 SEA L40 NOT (L41 OR L42 OR L43) L46 2064 DUP REM L41 L42 L43 L45 (611 DUPLICATES REMOVED) ANSWERS '1-2064' FROM FILE TOXCENTER L*** DEL 525 S L40 AND MEDLINE/FS L*** DEL 525 S L40 AND MEDLINE/FS L47 525 SEA L46 L*** DEL 833 S L40 AND BIOSIS/FS L*** DEL 833 S L40 AND BIOSIS/FS L48 644 SEA L46 L*** DEL 1263 S L40 AND CAPLUS/FS L*** DEL 1263 S L40 AND CAPLUS/FS L49 859 SEA L46 L*** DEL 54 S L40 NOT (L41 OR L42 OR L43) L*** DEL 54 S L40 NOT (L41 OR L42 OR L43) L50 36 SEA L46 L51 1539 SEA (L47 OR L48 OR L49 OR L50) NOT MEDLINE/FS L52 1532 SEA L51 AND L1

Table B-2. Database Query Strings Pre-Public Comment Searches

Database search date	Query string
	L53 7 SEA L51 NOT L52 D SCAN L53 L54 688 SEA L6 NOT L7 L55 485 SEA L54 NOT (PATENT/DT OR TSCATS/FS) L56 314 SEA L55 AND L37 L57 0 SEA L56 AND MEDLINE/FS L58 85 SEA L56 AND BIOSIS/FS L59 218 SEA L56 AND CAPLUS/FS L60 1 SEA L56 AND IPA/FS L61 274 DUP REM L56 (40 DUPLICATES REMOVED) ANSWERS '1-274' FROM FILE TOXCENTER D SCAN L52

Table B-3. Strategies to Augment the Literature Search

Source	Query and number screened when available
TSCATS[a]	
9/2017; 2/2015	Compounds searched: 1071-83-6; 34494-03-6; 40465-66-5; 70393-85-0; 38641-94-0; 81591-81-3
NTP	
9/2017	glyphosate AND cancer; Limited to 2010-2017
2/2015	"1071-83-6" OR "Glifoglex" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "Glyphosate" OR "Glyphosphate" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phosphonomethylglycine" OR "Pondmaster" OR "Silglif" OR "yerbimat" "34494-03-6" OR "40465-66-5" OR "70393-85-0" OR "MON 0459" OR "MON 14420" OR "MON 8750" OR "Roundup Hi-Load" OR "Roundup PRODry" OR "MON 8000" OR "Monsanto 8000" OR "Polado" OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate)" "38641-94-0" OR "Glyphosate-isopropylammonium" OR "Glyphosate isopropylamine salt" OR "Azural AT" OR "Buggy" OR "CP 70139" OR "Fosulen" OR "Glifosato estrella" OR "Glycel" OR "Glyfos AU" OR "Glyfos BIO" OR "Glyphosate isopropylamine salt" OR "Glyphosate mono(isopropylamine) salt" OR "Glyphosate-isopropylammonium" OR "Glyphosate-mono(isopropylammonium)" OR "Landmaster" OR "MON 139" OR "MON 39" OR "N-(Phosphonomethyl)glycine isopropylamine salt" OR "N-(Phosphonomethyl)glycine isopropylammonium salt" OR "N-(Phosphonomethyl)glycine monoisopropylamine salt" OR "Nitosorg" OR "Ron-do" OR "Utal" OR "Vision (herbicide)" OR "Roundup" OR "Isopropylamine glyphosate" OR "81591-81-3" OR "Glyphosate-trimesium" OR "Glyphosphate-trimesium" OR "Avans 330" OR "Glyphosate mono(trimethylsulfonium) salt" OR "Glyphosate trimethylsulfonium salt" OR "Glyphosate-trimesium" OR "Medallon" OR "Ouragan" OR "R 50224" OR "SC 0224" OR "Sulfosate" OR "Sulphosate" OR "Touchdown" OR "Trimethylsulfonium carboxymethylamino-methylphosphonate" OR "Trimethylsulfonium glyphosate"
NPIRS 9/2017; 2/2015	PC Codes searched: 417300; 103603; 103613; 103604; 103607; 103601; 128501

Table B-3. Strategies to Augment the Literature Search

Source	Query and number screened when available
NIH RePORTER	
4/2017	Text Search: "Carboxymethylamino)methylphosphonic acid" OR "2-Propanamine, compd, with N-(phosphonomethyl)glycine (1:1)" OR "Avans 330" OR "Azural AT" OR "C-K Yuyos FAV" OR "Carboxymethylaminomethanephosphinic acid" OR "CP 67573" OR "CP 70139" OR "Diammonium N-(phosphonomethyl)glycine" OR "Folusen" OR "Forsat" OR "Fosulen" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "Glifosato estrella" OR "gliphosate" OR "Gliz" OR "Glycel" OR "Glycine, N-(phosphonomethyl)-, cmpd with 2-propanamine (1:1)" OR "Glycine, N-(phosphonomethyl)-, compd. with 2-propanamine (1:1)" OR "Glycine, N-(phosphonomethyl)-, ion(1-), trimethylsulfonium" OR "Glyfos" OR "Glyfos AU" OR "Glyfos BIO" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "Landmaster" OR "Medallon" OR "MON 0459" OR "MON 139" OR "MON 14420" OR "MON 2139" OR "MON 3539" OR "MON 39" OR "MON 6000" OR "MON 8000" OR "MON 8750" OR "Monsanto 8000" OR "N-(phosphonomethyl)-Glycine" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)glycine ammonium salt" OR "N-(phosphonomethyl)glycine diammonium salt" OR "N-(Phosphonomethyl)glycine isopropylamine salt" OR "N-(Phosphonomethyl)glycine isopropylammonium salt" OR "N-(Phosphonomethyl)glycine monoisopropylamine salt" OR "N-(phosphonomethyl)glycine potassium salt" OR "N-(Phosphonomethyl)glycine, compound with 2-propylamine (1:1)" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Nitosorg" OR "Ouragan" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Polado" OR "Pondmaster" OR "Potassium N-(phosphonomethyl)glycine" OR "R 50224" OR "Rebel Garden" OR "Ron-do" OR "Roundup" OR "Safal" OR "SC 0224" OR "Scout herbicide" OR "Silglif" OR "Sulfosate" OR "Sulphosate" OR "Touchdown Forte HiTech" OR "Touchdown herbicide" OR "Transorb R" OR "Trimethylsulfonium carboxymethylamino-methylphosphonate" OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate" OR "Uragan Forte" OR "Utal" OR "Vision herbicide" OR "VisionMAX" OR "Weathermax" OR "yerbimat" OR "Zapp Qi" (Advanced), Search in: Projects AdminIC: All, Fiscal Year: Active Projects, 2017, 2016, 2015, 2014, 2013, 2012
Other	Identified throughout the assessment process

[a]Several versions of the TSCATS database were searched, as needed, by CASRN including TSCATS1 via Toxline (no date limit), TSCATS2 via https://yosemite.epa.gov/oppts/epatscat8.nsf/ReportSearch?OpenForm (date restricted by EPA receipt date), and TSCATS via CDAT (date restricted by 'Mail Received Date Range'), as well as google for recent TSCA submissions.

The 2015 and 2017 results were:

- Number of records identified from PubMed, TOXLINE, and TOXCENTER (after duplicate removal): 5,592
- Number of records identified from other strategies: 211
- Total number of records to undergo literature screening: 5,803

Following the publication of the draft profile and receipt of public comments, ATSDR conducted an updated literature review to capture any references published after the conclusion of the original literature review. The updated literature review searches occurred in September and October 2019 using the following sources:

- Toxline
- IPA
- Science Direct
- PubMed
- BIOSIS
- MEDLINE
- SciFinder

In each database, searches were limited to references published from 2017 (i.e., the year the literature searches for glyphosate were last conducted) to the present date. Table B-4 includes the search strings used in each of these searches.

Table B-4. Database Query Strings Post-Public Comment Searches

Database search date	Query String
Toxline 9/2019	("lancer herbicide" OR "mon 2139" OR "mon 3539" OR "mon 6000" OR "phorsat" OR "phosphonomethyliminoacetic acid" OR "rebel garden" OR "roundup max" OR "safal" OR "scout herbicide")
	(" (carboxymethylamino) methylphosphonic acid" OR "carboxymethylaminomethanephosphinic acid" OR "c k yuyos fav" OR "cp 67573" OR "folusen" OR "forsat" OR "glialka" OR "glifosan 747" OR "glygran" OR "glyphodin a" OR "glyphomax" OR "ground bio" OR "herbatop" OR "hm 2028" OR "kickdown")
	("glifoglex" OR "gliphosate" OR "gliz" OR "glyfos" OR "glyphosate" OR "glyphosphate" OR "n (phosphonomethyl) glycine" OR "n (phosphonomethyl) glycine" OR "n phosphomethylglycine" OR "n phosphonomethylglycine" OR "phosphonomethylglycine" OR "pondmaster" OR "silglif" OR "yerbimat")
	1071-83-6 [rn]
	"roundup"
	("mon 0459" OR "40465 66 5" OR "mon 14420" OR "mon 8750" OR "roundup hi load" OR "roundup prodry" OR "mon 8000" OR "monsanto 8000" OR "polado" OR "trisodium hydrogen bis (n (phosphonatomethyl) aminoacetate) ")
	(34494-03-6 [rn] OR 70393-85-0 [rn])
	("glyphosate diammonium" OR "diammonium n (phosphonomethyl) glycine" OR "n (phosphonomethyl) glycine diammonium salt")
	(roundup weathermax OR touchdown forte hitech OR transorb r OR weathermax OR zapp qi OR glyphosate potassium OR potassium glyphosate OR potassium n (phosphonomethyl) glycine OR uragan forte OR visionmax OR n (phosphonomethyl) glycine potassium salt OR glyphosate ammonium OR n (phosphonomethyl) glycine ammonium salt)
	("glyphosate potassium" OR "glyphosate monopotassium salt" OR "glyphosate potassium" OR "glyphosate potassium" OR "monopotassium glyphosate" OR "roundup attack" OR "roundup energy" OR "roundup maxload" OR "roundup original max" OR "roundup power max" OR "roundup ultramax ii")
	(39600-42-5 [rn] OR 39600-55-0 [rn] OR 39600-56-1 [rn] OR 39600-58-3 [rn] OR 40465-59-6 [rn] OR 40465-64-3 [rn] OR 40465-67-6 [rn] OR 40465-70-1 [rn] OR 40465-90-5 [rn] OR 40465-91-6 [rn] OR 70901-12-1 [rn] OR 114370-14-8 [rn] OR 69254-40-6 [rn])
IPA 9/2019	("1071-83-6" or "38641-94-0").rn. and ("Glyphosate" or "glyphosate isopropylamine" or "Glyphosphate" or "N-(phosphonomethyl)glycine " or "glycine, N-(phosphonomethyl)-, compound with 2-propanamine (1:1)" or "phosphonomethyliminoacetic acid" or "glyphosate acid" or "glyphosate-isopropylammonium" or "glyphosate mono(isopropylamine) salt" or "glyphosate-mono(isopropylammonium)" or "N-(phosphonomethyl)glycine, isopropylamine salt" or "Pondmaster" or "Roundup Max" or "Glifoglex" or "Glycel" or "Rondo" or "Spasor" or "Tumbleweed" or "MON-0573" or "CP 67573" or "Roundup" or "Glifonox" or "MON-0139" or "CP 70139").rw. and ("Glyphosate" or "glyphosate isopropylamine").sh.

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
Science Direct 9/2019	Glyphosate OR Glyphosphate OR "N phosphonomethyl glycine" OR "phosphonomethyliminoacetic acid" OR "glyphosate acid"
	"Glyphosate isopropylamine" OR "Glycine, N-phosphonomethyl-, compound with 2-propanamine 1:1" OR "glyphosate-isopropylammonium" OR "glyphosate monoisopropylamine salt" OR "glyphosate-monoisopropylammonium" OR "N phosphonomethyl)glycine, isopropylamine salt"
	"Pondmaster" OR "Roundup Max" OR Glifoglex OR Glycel OR Rondo OR Spasor OR Tumbleweed OR "MON-0573" OR "CP 67573"
	Roundup OR Rondo OR Glifonox OR Glycel OR "MON-0139" OR "CP 70139"
	(Sonic AND Herbicide NOT Ultrasonic) OR (Rodeo and Herbicide)
PubMed 9/2019	("glyphosate"[nm] OR "1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw] OR "Roundup"[tw] OR "34494-03-6"[tw] OR "MON 0459"[tw] OR "40465-66-5"[tw] OR "MON 14420"[tw] OR "MON 8750"[tw] OR "Roundup Hi-Load"[tw] OR "Roundup PRODry"[tw] OR "70393-85-0"[tw] OR "MON 8000"[tw] OR "Monsanto 8000"[tw] OR "Polado"[tw] OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate"[tw] OR "39600-42-5"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate monopotassium salt"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate-potassium"[tw] OR "Monopotassium glyphosate"[tw] OR "Roundup Attack"[tw] OR "Roundup Energy"[tw] OR "Roundup Maxload"[tw] OR "Roundup Original Max"[tw] OR "Roundup Power Max"[tw] OR "Roundup Ultramax II"[tw] OR "Roundup Weathermax"[tw] OR "Touchdown Forte HiTech"[tw] OR "Transorb R"[tw] OR "Weathermax"[tw] OR "Zapp Qi"[tw] OR "70901-12-1"[tw] OR "Glyphosate-potassium"[tw] OR "Potassium glyphosate"[tw] OR "Potassium N-(phosphonomethyl)glycine"[tw] OR "Uragan Forte"[tw] OR "VisionMAX"[tw] OR "N-(phosphonomethyl)glycine potassium salt"[tw] OR "114370-14-8"[tw] OR "Glyphosate ammonium"[tw] OR "N-(phosphonomethyl)glycine ammonium salt"[tw] OR "69254-40-6"[tw] OR "Glyphosate-diammonium"[tw] OR "Diammonium N-(phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)glycine diammonium salt"[tw]) AND (cancer[sb] OR "neoplasms"[mh] OR "carcinogenicity tests"[mh] OR "carcinogens"[mh] OR "cell division/drug effects"[mh] OR "cell cycle/drug effects"[mh] OR "cell line, tumor/drug effects"[mh] OR "gene expression regulation, neoplastic"[mh] OR "neoplasm proteins/drug effects"[mh] OR "angiogenesis inducing agents"[mh] OR "myelodysplastic-myeloproliferative diseases"[mh] OR cancer*[tw] OR carcinog*[tw] OR carcinom*[tw] OR cocarcinog*[tw] OR lymphoma*[tw] OR neoplas*[tw] OR oncogen*[tw] OR precancer*[tw] OR tumor*[tw] OR tumour*[tw]) AND (2017/01/01 : 3000[dp])
	("glyphosate, isopropyl amine salt"[nm] OR "N-(phosphonomethyl)glycine trimethylsulfonium salt"[nm] OR "38641-94-0"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Azural AT"[tw] OR "CP 70139"[tw] OR "Fosulen"[tw] OR "Glifosato estrella"[tw] OR "Glycel"[tw] OR "Glycine, N-(phosphonomethyl)-, cmpd with 2-propanamine (1:1)"[tw] OR "Glyfos AU"[tw] OR "Glyfos BIO"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Glyphosate mono(isopropylamine) salt"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate-mono(isopropylammonium)"[tw] OR "Landmaster"[tw] OR "MON 139"[tw] OR "MON 39"[tw] OR "N-(Phosphonomethyl)glycine

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	isopropylamine salt"[tw] OR "N-(Phosphonomethyl)glycine isopropylammonium salt"[tw] OR "N-(Phosphonomethyl)glycine monoisopropylamine salt"[tw] OR "Nitosorg"[tw] OR "Rondo"[tw] OR "Utal"[tw] OR "Utal (herbicide)"[tw] OR "Vision (herbicide)"[tw] OR "2-Propanamine, compd, with N-(phosphonomethyl)glycine (1:1)"[tw] OR "Glycine, N-(phosphonomethyl)-, compd. with 2-propanamine (1:1)"[tw] OR "N-(Phosphonomethyl)glycine, compound with 2-propylamine (1:1)"[tw] OR "Isopropylamine glyphosate"[tw] OR "81591-81-3"[tw] OR "Glyphosate-trimesium"[tw] OR "Glyphosphate-trimesium"[tw] OR "Avans 330"[tw] OR "Glyphosate mono(trimethylsulfonium) salt"[tw] OR "Glyphosate trimethylsulfonium salt"[tw] OR "Glyphosate-trimesium"[tw] OR "Medallon"[tw] OR "Ouragan"[tw] OR "R 50224"[tw] OR "SC 0224"[tw] OR "Sulfosate"[tw] OR "Sulphosate"[tw] OR "Touchdown herbicide"[tw] OR "Trimethylsulfonium carboxymethylamino-methylphosphonate"[tw] OR "Trimethylsulfonium glyphosate"[tw] OR "Glycine, N-(phosphonomethyl)-, ion(1-), trimethylsulfonium"[tw] OR "Sulfosate"[tw]) AND (cancer[sb] OR "neoplasms"[mh] OR "carcinogenicity tests"[mh] OR "carcinogens"[mh] OR "cell division/drug effects"[mh] OR "cell cycle/drug effects"[mh] OR "cell line, tumor/drug effects"[mh] OR "gene expression regulation, neoplastic"[mh] OR "neoplasm proteins/drug effects"[mh] OR "angiogenesis inducing agents"[mh] OR "myelodysplastic-myeloproliferative diseases"[mh] OR cancer*[tw] OR carcinog*[tw] OR carcinom*[tw] OR cocarcinog*[tw] OR lymphoma*[tw] OR neoplas*[tw] OR oncogen*[tw] OR precancer*[tw] OR tumor*[tw] OR tumour*[tw]) AND (2017/01/01 : 3000[dp])
	("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	"N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb]) AND (2017/01/01 : 3000[dp])
	("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw])) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb])) AND (2017/01/01 : 3000[dp])

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	("34494-03-6"[tw] OR "MON 0459"[tw] OR "40465-66-5"[tw] OR "MON 14420"[tw] OR "MON 8750"[tw] OR "Roundup Hi-Load"[tw] OR "Roundup PRODry"[tw] OR "70393-85-0"[tw] OR "MON 8000"[tw] OR "Monsanto 8000"[tw] OR "Polado"[tw] OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr]) AND (2017/01/01 : 3000[dp])
	("39600-42-5"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate monopotassium salt"[tw] OR "Glyphosate potassium"[tw] OR "Glyphosate-potassium"[tw] OR "Monopotassium glyphosate"[tw] OR "Roundup Attack"[tw] OR "Roundup Energy"[tw] OR "Roundup Maxload"[tw] OR "Roundup Original Max"[tw] OR "Roundup Power Max"[tw] OR "Roundup Ultramax II"[tw] OR "Roundup Weathermax"[tw] OR "Touchdown Forte HiTech"[tw] OR "Transorb R"[tw] OR "Weathermax"[tw] OR "Zapp Qi"[tw] OR "70901-12-1"[tw] OR "Glyphosate-potassium"[tw] OR "Potassium glyphosate"[tw] OR "Potassium N-(phosphonomethyl)glycine"[tw] OR "Uragan Forte"[tw] OR "VisionMAX"[tw] OR "N-(phosphonomethyl)glycine potassium salt"[tw] OR "114370-14-8"[tw] OR "Glyphosate ammonium"[tw] OR "N-(phosphonomethyl)glycine ammonium salt"[tw] OR "69254-40-6"[tw] OR "Glyphosate-diammonium"[tw] OR "Diammonium N-(phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)glycine diammonium salt"[tw]) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh]

Table B-4. Database Query Strings Post-Public Comment Searches

Database search date	Query String
	OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb]) OR ("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw]))) AND (2017/01/01 : 3000[dp])
	((("glyphosate, isopropyl amine salt"[nm]) OR ("N-(phosphonomethyl)glycine trimethylsulfonium salt"[nm])) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic

Table B-4. Database Query Strings Post-Public Comment Searches

Database search date	Query String
	acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb]) OR ("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw])))) OR (("38641-94-0"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Azural AT"[tw] OR "CP 70139"[tw] OR "Fosulen"[tw] OR "Glifosato estrella"[tw] OR "Glycel"[tw] OR "Glycine, N-(phosphonomethyl)-, cmpd with 2-propanamine (1:1)"[tw] OR "Glyfos AU"[tw] OR "Glyfos BIO"[tw] OR "Glyphosate isopropylamine salt"[tw] OR "Glyphosate mono(isopropylamine) salt"[tw] OR "Glyphosate-isopropylammonium"[tw] OR "Glyphosate-mono(isopropylammonium)"[tw] OR "Landmaster"[tw] OR "MON 139"[tw] OR "MON 39"[tw] OR "N-(Phosphonomethyl)glycine isopropylamine salt"[tw] OR "N-(Phosphonomethyl)glycine isopropylammonium salt"[tw] OR "N-(Phosphonomethyl)glycine monoisopropylamine salt"[tw] OR "Nitosorg"[tw] OR "Ron-do"[tw] OR "Utal"[tw] OR "Utal (herbicide)"[tw] OR "Vision (herbicide)"[tw] OR "2-Propanamine, compd, with N-(phosphonomethyl)glycine (1:1)"[tw] OR "Glycine, N-(phosphonomethyl)-, compd. with 2-propanamine (1:1)"[tw] OR "N-(Phosphonomethyl)glycine, compound with 2-propylamine (1:1)"[tw] OR "Isopropylamine glyphosate"[tw] OR "81591-81-3"[tw] OR "Glyphosate-trimesium"[tw] OR "Glyphosphate-trimesium"[tw] OR "Avans 330"[tw] OR "Glyphosate mono(trimethylsulfonium) salt"[tw] OR "Glyphosate trimethylsulfonium salt"[tw] OR "Glyphosate-trimesium"[tw] OR "Medallon"[tw] OR "Ouragan"[tw] OR "R 50224"[tw] OR "SC 0224"[tw] OR "Sulfosate"[tw] OR "Sulphosate"[tw] OR "Touchdown herbicide"[tw] OR "Trimethylsulfonium carboxymethylamino-methylphosphonate"[tw] OR "Trimethylsulfonium glyphosate"[tw] OR "Glycine, N-(phosphonomethyl)-, ion(1-), trimethylsulfonium"[tw] OR "Sulfosate"[tw]) NOT (("glyphosate"[nm]) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) AND (to[sh] OR po[sh] OR ae[sh] OR pk[sh] OR (me[sh] AND ("humans"[mh] OR "animals"[mh])) OR ci[sh] OR bl[sh] OR cf[sh] OR ur[sh] OR "environmental exposure"[mh] OR "endocrine system"[mh] OR "hormones, hormone substitutes, and hormone

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	antagonists"[mh] OR "endocrine disruptors"[mh] OR (("Computational biology"[mh] OR "Medical Informatics"[mh] OR Genomics[mh] OR Genome[mh] OR Proteomics[mh] OR Proteome[mh] OR Metabolomics[mh] OR Metabolome[mh] OR Genes[mh] OR "Gene expression"[mh] OR Phenotype[mh] OR genetics[mh] OR genotype[mh] OR Transcriptome[mh] OR ("Systems Biology"[mh] AND ("Environmental Exposure"[mh] OR "Epidemiological Monitoring"[mh] OR analysis[sh])) OR "Transcription, Genetic "[mh] OR "Reverse transcription"[mh] OR "Transcriptional activation"[mh] OR "Transcription factors"[mh] OR ("biosynthesis"[sh] AND (RNA[mh] OR DNA[mh])) OR "RNA, Messenger"[mh] OR "RNA, Transfer"[mh] OR "peptide biosynthesis"[mh] OR "protein biosynthesis"[mh] OR "Reverse Transcriptase Polymerase Chain Reaction"[mh] OR "Base Sequence"[mh] OR "Trans-activators"[mh] OR "Gene Expression Profiling"[mh])) OR cancer[sb] OR "pharmacology"[Majr])) OR (("1071-83-6"[tw] OR "(Carboxymethylamino)methylphosphonic acid"[tw] OR "Carboxymethylaminomethanephosphinic acid"[tw] OR "C-K Yuyos FAV"[tw] OR "CP 67573"[tw] OR "Folusen"[tw] OR "Forsat"[tw] OR "Glialka"[tw] OR "Glifoglex"[tw] OR "Glifosan 747"[tw] OR "gliphosate"[tw] OR "Gliz"[tw] OR "Glyfos"[tw] OR "GlyGran"[tw] OR "Glyphodin A"[tw] OR "Glyphomax"[tw] OR "Glyphosate"[tw] OR "Glyphosphate"[tw] OR "Ground Bio"[tw] OR "Herbatop"[tw] OR "HM 2028"[tw] OR "Kickdown"[tw] OR "Lancer herbicide"[tw] OR "MON 2139"[tw] OR "MON 3539"[tw] OR "MON 6000"[tw] OR "N-(Phosphonomethyl)glycine"[tw] OR "N-(phosphonomethyl)-Glycine"[tw] OR "N-Phosphomethylglycine"[tw] OR "N-Phosphonomethylglycine"[tw] OR "Phorsat"[tw] OR "Phosphonomethylglycine"[tw] OR "Phosphonomethyliminoacetic acid"[tw] OR "Pondmaster"[tw] OR "Rebel Garden"[tw] OR "Roundup Max"[tw] OR "Safal"[tw] OR "Scout herbicide"[tw] OR "Silglif"[tw] OR "yerbimat"[tw]) NOT medline[sb]) OR ("Roundup"[tw] AND (monsanto[tw] OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[MeSH Terms] OR "antifungal"[tw] OR "anti-fungal"[tw] OR "enzyme inhibitors"[Pharmacological Action] OR "enzyme inhibitors"[MeSH Terms] OR ("enzyme"[tw] AND inhibitor*[tw]) OR "enzyme inhibitors"[tw] OR "enzyme inhibitor"[tw] OR "herbicides"[Pharmacological Action] OR "herbicides"[MeSH Terms] OR "herbicides"[tw] OR "herbicide"[tw] OR "uncoupling agents"[Pharmacological Action] OR "uncoupling agents"[MeSH Terms] OR ("uncoupling"[tw] AND agent*[tw]) OR "uncoupling agent"[tw] OR "uncoupling agents"[tw] OR "pesticides"[mh] OR pesticide*[tw]))))) AND (2017/01/01 : 3000[dp])
BIOSIS 9/2019	CH=(Glyphosate OR "glyphosate isopropylamine" OR Glyphosphate OR "N-(phosphonomethyl)glycine " OR "glycine, N-(phosphonomethyl)-, compound with 2-propanamine (1:1)" OR "phosphonomethyliminoacetic acid" OR "glyphosate acid" OR "glyphosate-isopropylammonium" OR "glyphosate mono(isopropylamine) salt" OR "glyphosate-mono(isopropylammonium)" OR "N-(phosphonomethyl)glycine, isopropylamine salt" OR Pondmaster OR "Roundup Max" OR Glifoglex OR Glycel OR ((Muster) AND (pesticide OR herbicide)) OR Rondo OR ((Sonic) AND (pesticide OR herbicide)) OR Spasor OR ((Sting) AND (pesticide OR herbicide)) OR Tumbleweed OR "MON-0573" OR "CP 67573" OR Roundup OR ((Rodeo) AND (pesticide OR herbicide)) OR Glifonox OR "MON-0139" OR "CP 70139" OR ((Shackle) AND (pesticide OR herbicide)) OR "1071-83-6" OR "38641-94-0") Indexes=BCI Timespan=2017-2019
MEDLINE 9/2019	("glyphosate" OR "1071-83-6" OR "(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	"yerbimat" OR "Roundup" OR "34494-03-6" OR "MON 0459" OR "40465-66-5" OR "MON 14420" OR "MON 8750" OR "Roundup Hi-Load" OR "Roundup PRODry" OR "70393-85-0" OR "MON 8000" OR "Monsanto 8000" OR "Polado" OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate" OR "39600-42-5" OR "Glyphosate potassium" OR "Glyphosate monopotassium salt" OR "Glyphosate potassium" OR "Glyphosate-potassium" OR "Monopotassium glyphosate" OR "Roundup Attack" OR "Roundup Energy" OR "Roundup Maxload" OR "Roundup Original Max" OR "Roundup Power Max" OR "Roundup Ultramax II" OR "Roundup Weathermax" OR "Touchdown Forte HiTech" OR "Transorb R" OR "Weathermax" OR "Zapp Qi" OR "70901-12-1" OR "Glyphosate-potassium" OR "Potassium glyphosate" OR "Potassium N-(phosphonomethyl)glycine" OR "Uragan Forte" OR "VisionMAX" OR "N-(phosphonomethyl)glycine potassium salt" OR "114370-14-8" OR "Glyphosate ammonium" OR "N-(phosphonomethyl)glycine ammonium salt" OR "69254-40-6" OR "Glyphosate-diammonium" OR "Diammonium N-(phosphonomethyl)glycine" OR "N-(phosphonomethyl)glycine diammonium salt") AND MH (("neoplasms" OR "carcinogenicity tests" OR "carcinogens" OR "cell division/drug effects" OR "cell cycle/drug effects" OR "cell line, tumor/drug effects" OR "gene expression regulation, neoplastic" OR "neoplasm proteins/drug effects" OR "angiogenesis inducing agents" OR "myelodysplastic-myeloproliferative diseases") OR AB (cancer* OR carcinog* OR carcinom* OR cocarcinog* OR lymphoma* OR neoplas* OR oncogen* OR precancer* OR tumor* OR tumour*))
	("glyphosate, isopropyl amine salt" OR "N-(phosphonomethyl)glycine trimethylsulfonium salt" OR "38641-94-0" OR "Glyphosate-isopropylammonium" OR "Glyphosate isopropylamine salt" OR "Azural AT" OR "CP 70139" OR "Fosulen" OR "Glifosato estrella" OR "Glycel" OR "Glycine, N-(phosphonomethyl)-, cmpd with 2-propanamine (1:1)" OR "Glyfos AU" OR "Glyfos BIO" OR "Glyphosate isopropylamine salt" OR "Glyphosate mono(isopropylamine) salt" OR "Glyphosate-isopropylammonium" OR "Glyphosate-mono(isopropylammonium)" OR "Landmaster" OR "MON 139" OR "MON 39" OR "N-(Phosphonomethyl)glycine isopropylamine salt" OR "N-(Phosphonomethyl)glycine isopropylammonium salt" OR "N-(Phosphonomethyl)glycine monoisopropylamine salt" OR "Nitosorg" OR "Ron-do" OR "Utal" OR "Utal (herbicide)" OR "Vision (herbicide)" OR "2-Propanamine, compd, with N-(phosphonomethyl)glycine (1:1)" OR "Glycine, N-(phosphonomethyl)-, compd. with 2-propanamine (1:1)" OR "N-(Phosphonomethyl)glycine, compound with 2-propylamine (1:1)" OR "Isopropylamine glyphosate" OR "81591-81-3" OR "Glyphosate-trimesium" OR "Glyphosphate-trimesium" OR "Avans 330" OR "Glyphosate mono(trimethylsulfonium) salt" OR "Glyphosate trimethylsulfonium salt" OR "Glyphosate-trimesium" OR "Medallon" OR "Ouragan" OR "R 50224" OR "SC 0224" OR "Sulfosate" OR "Sulphosate" OR "Touchdown herbicide" OR "Trimethylsulfonium carboxymethylamino-methylphosphonate" OR "Trimethylsulfonium glyphosate" OR "Glycine, N-(phosphonomethyl)-, ion(1-), trimethylsulfonium" OR "Sulfosate") AND (MH ("neoplasms" OR "carcinogenicity tests" OR "carcinogens" OR "cell division/drug effects" OR "cell cycle/drug effects" OR "cell line, tumor/drug effects" OR "gene expression regulation, neoplastic" OR "neoplasm proteins/drug effects" OR "angiogenesis inducing agents" OR "myelodysplastic-myeloproliferative diseases") OR AB(cancer* OR carcinog* OR carcinom* OR cocarcinog* OR lymphoma* OR neoplas* OR oncogen* OR precancer* OR tumor* OR tumour*))
	AB ("glyphosate" OR "1071-83-6" OR "(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR

Table B-4. Database Query Strings Post-Public Comment Searches

Database search date	Query String
	"Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat") AND (MH ("humans" OR "animals" OR "environmental exposure" OR "endocrine system" OR "hormones, hormone substitutes, and hormone antagonists" OR "endocrine disruptors" OR "Computational biology" OR "Medical Informatics" OR Genomics OR Genome OR Proteomics OR Proteome OR Metabolomics OR Metabolome OR Genes OR "Gene expression" OR Phenotype OR genetics OR genotype OR Transcriptome OR "Systems Biology") OR AB ("toxicity" OR "poisoning" OR "adverse effects" OR "pharmacokinetics" OR "metabolism" OR "chemically induced" OR "blood" OR "cerebrospinal fluid" OR "urine")) AND MH (("Environmental Exposure" OR "Epidemiological Monitoring" OR "Transcription, Genetic " OR "Reverse transcription" OR "Transcriptional activation" OR "Transcription factors") OR AB (Analysis OR Biosynthesis)) AND MH ((RNA OR DNA OR "RNA, Messenger" OR "RNA, Transfer" OR "peptide biosynthesis" OR "protein biosynthesis" OR "Reverse Transcriptase Polymerase Chain Reaction" OR "Base Sequence" OR "Trans-activators" OR "Gene Expression Profiling" OR "pharmacology") OR AB (cancer OR "1071-83-6" OR "Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat"))
	AB ("Roundup") AND (AB ((monsanto OR "antifungal agents" OR "antifungal" OR "anti-fungal" OR ("enzyme" AND inhibitor*) OR "enzyme inhibitors" OR "enzyme inhibitor" OR "herbicides" OR "herbicide" OR ("uncoupling" AND agent*) OR "uncoupling agent" OR "uncoupling agents" OR pesticide*) OR MH ("antifungal agents" OR "enzyme inhibitors" OR herbicides OR "uncoupling agents" OR pesticides)) (NOT (("glyphosate" OR "1071-83-6" OR "(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat")) AND AB ("toxicity" OR "poisoning" OR "adverse effects" OR "pharmacokinetics" OR "metabolism") AND (MH ("humans" OR "animals" OR "environmental exposure" OR "endocrine system" OR "hormones, hormone substitutes, and hormone antagonists" OR "endocrine disruptors" OR (("Computational biology" OR "Medical Informatics" OR Genomics OR Genome OR Proteomics OR Proteome OR Metabolomics OR Metabolome OR Genes OR "Gene expression" OR Phenotype OR genetics OR genotype OR Transcriptome OR "Transcription, Genetic " OR "Reverse transcription" OR "Transcriptional activation" OR "Transcription factors" OR "RNA, Messenger" OR "RNA, Transfer" OR "protein biosynthesis" OR "Reverse Transcriptase Polymerase Chain Reaction" OR "Base Sequence" OR "Trans-activators" OR "Gene Expression Profiling" OR "pharmacology") OR AB ("chemically induced" OR "blood" OR "cerebrospinal fluid" OR "urine" OR cancer OR "1071-83-6" OR "(Carboxymethylamino)methylphosphonic acid" OR

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	"Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat" OR "peptide biosynthesis") OR (AB("biosynthesis") AND MH(RNA OR DNA)) OR MH ("Systems Biology" AND ("Environmental Exposure" OR "Epidemiological Monitoring"))
	AB ("34494-03-6" OR "MON 0459" OR "40465-66-5" OR "MON 14420" OR "MON 8750" OR "Roundup Hi-Load" OR "Roundup PRODry" OR "70393-85-0" OR "MON 8000" OR "Monsanto 8000" OR "Polado" OR "Trisodium hydrogen bis(N-(phosphonatomethyl)aminoacetate") AND AB ("toxicity" OR "poisoning" OR "adverse effects" OR "pharmacokinetics" OR "metabolism") AND (AB ("chemically induced" OR "blood" OR "cerebrospinal fluid" OR "urine") OR MH ("humans" OR "animals" OR "environmental exposure" OR "endocrine system" OR "hormones, hormone substitutes, and hormone antagonists" OR "endocrine disruptors" OR "Computational biology" OR "Medical Informatics" OR Genomics OR Genome OR Proteomics OR Proteome OR Metabolomics OR Metabolome OR Genes OR "Gene expression" OR Phenotype OR genetics OR genotype OR Transcriptome OR "Systems Biology")) AND MH (("Environmental Exposure" OR "Epidemiological Monitoring" OR analysis)) OR "Transcription, Genetic " OR "Reverse transcription" OR "Transcriptional activation" OR "Transcription factors" OR ("biosynthesis" AND (RNA OR DNA)) OR "RNA, Messenger" OR "RNA, Transfer" OR "peptide biosynthesis" OR "protein biosynthesis" OR "Reverse Transcriptase Polymerase Chain Reaction" OR "Base Sequence" OR "Trans-activators" OR "Gene Expression Profiling" OR "pharmacology") OR AB (cancer))
	("39600-42-5" OR "Glyphosate potassium" OR "Glyphosate monopotassium salt" OR "Glyphosate potassium" OR "Glyphosate-potassium" OR "Monopotassium glyphosate" OR "Roundup Attack" OR "Roundup Energy" OR "Roundup Maxload" OR "Roundup Original Max" OR "Roundup Power Max" OR "Roundup Ultramax II" OR "Roundup Weathermax" OR "Touchdown Forte HiTech" OR "Transorb R" OR "Weathermax" OR "Zapp Qi" OR "70901-12-1" OR "Glyphosate-potassium" OR "Potassium glyphosate" OR "Potassium N-(phosphonomethyl)glycine" OR "Uragan Forte" OR "VisionMAX" OR "N-(phosphonomethyl)glycine potassium salt" OR "114370-14-8" OR "Glyphosate ammonium" OR "N-(phosphonomethyl)glycine ammonium salt" OR "69254-40-6" OR "Glyphosate-diammonium" OR "Diammonium N-(phosphonomethyl)glycine" OR "N-(phosphonomethyl)glycine diammonium salt") NOT (("glyphosate") OR (("1071-83-6" OR "(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat") AND AB ("toxicity" OR "poisoning" OR "adverse effects" OR "pharmacokinetics" OR "metabolism") AND MH (("humans" OR "animals" OR "environmental exposure" OR

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	"endocrine system" OR "hormones, hormone substitutes, and hormone antagonists" OR "endocrine disruptors" OR (("Computational biology" OR "Medical Informatics" OR Genomics OR Genome OR Proteomics OR Proteome OR Metabolomics OR Metabolome OR Genes OR "Gene expression" OR Phenotype OR genetics OR genotype OR Transcriptome OR ("Systems Biology" OR (AB ("chemically induced" OR "blood" OR "cerebrospinal fluid" OR "urine")) AND MH("Environmental Exposure" OR "Epidemiological Monitoring" OR analysis)) OR "Transcription, Genetic " OR "Reverse transcription" OR "Transcriptional activation" OR "Transcription factors") OR AB ("biosynthesis")) AND (RNA OR DNA OR "RNA, Messenger" OR "RNA, Transfer" OR "peptide biosynthesis" OR "protein biosynthesis" OR "Reverse Transcriptase Polymerase Chain Reaction" OR "Base Sequence" OR "Trans-activators" OR "Gene Expression Profiling" OR "pharmacology" OR "antifungal agents"[Pharmacological Action] OR "antifungal agents"[Terms] OR "antifungal" OR "anti-fungal" OR "enzyme inhibitors" OR AB (cancer OR "1071-83-6" OR "(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat" OR "Roundup") AND AB (monsanto OR "enzyme") AND AB ((inhibitor* OR "enzyme inhibitors" OR "enzyme inhibitor" OR "herbicides" OR "herbicide" OR "uncoupling agents" OR "uncoupling") OR MH (herbicides OR "uncoupling agents")) AND AB (agent* OR "uncoupling agent" OR "uncoupling agents" OR Pesticide*) OR MH (Pesticides)
	(TX ("glyphosate, isopropyl amine salt" OR "N-(phosphonomethyl)glycine trimethylsulfonium salt")) NOT TX ("glyphosate") OR (TX ("1071-83-6"OR "(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid"OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden"OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat")) AND (MH ("humans" OR "animals") OR MH ("environmental exposure" OR "endocrine system" OR "hormones, hormone substitutes, and hormone antagonists" OR "endocrine disruptors") OR MH ("Computational biology" OR "Medical Informatics" OR Genomics OR Genome OR Proteomics OR Proteome OR Metabolomics OR Metabolome OR Genes OR "Gene expression" OR Phenotype OR genetics OR genotype OR Transcriptome OR "Transcription, Genetic " OR "Reverse transcription" OR "Transcriptional activation" OR "Transcription factors" OR "RNA, Messenger" OR "RNA, Transfer" OR "peptide biosynthesis" OR "protein biosynthesis" OR "Reverse Transcriptase Polymerase Chain Reaction" OR "Base Sequence" OR "Trans-activators" OR "Gene Expression Profiling") OR MH ("Systems Biology")) AND (MH ("Environmental Exposure" OR "Epidemiological Monitoring") OR MW (analysis) OR MW ("biosynthesis")) AND (MH (RNA OR DNA) OR AB (cancer) OR MM ("pharmacology")) AND (MH ("humans" OR "animals") OR MH ("environmental exposure" OR "endocrine system" OR "hormones, hormone substitutes, and hormone antagonists" OR "endocrine disruptors" OR (("Computational biology" OR "Medical Informatics" OR Genomics

Table B-4. Database Query Strings Post-Public Comment Searches	
Database search date	Query String
	OR Genome OR Proteomics OR Proteome OR Metabolomics OR Metabolome OR Genes OR "Gene expression" OR Phenotype OR genetics OR genotype OR Transcriptome OR ("Systems Biology" AND ("Environmental Exposure" OR "Epidemiological Monitoring") OR MW (analysis) OR MH ("Transcription, Genetic" OR "Reverse transcription" OR "Transcriptional activation" OR "Transcription factors") OR MW ("biosynthesis")) AND (MH ((RNA OR DNA) OR "RNA, Messenger" OR "RNA, Transfer" OR "peptide biosynthesis" OR "protein biosynthesis" OR "Reverse Transcriptase Polymerase Chain Reaction" OR "Base Sequence" OR "Trans-activators" OR "Gene Expression Profiling") OR AB (cancer) OR MM ("pharmacology") OR TX (("1071-83-6" OR "(Carboxymethylamino)methylphosphonic acid" OR "Carboxymethylaminomethanephosphinic acid" OR "C-K Yuyos FAV" OR "CP 67573" OR "Folusen" OR "Forsat" OR "Glialka" OR "Glifoglex" OR "Glifosan 747" OR "gliphosate" OR "Gliz" OR "Glyfos" OR "GlyGran" OR "Glyphodin A" OR "Glyphomax" OR "Glyphosate" OR "Glyphosphate" OR "Ground Bio" OR "Herbatop" OR "HM 2028" OR "Kickdown" OR "Lancer herbicide" OR "MON 2139" OR "MON 3539" OR "MON 6000" OR "N-(Phosphonomethyl)glycine" OR "N-(phosphonomethyl)-Glycine" OR "N-Phosphomethylglycine" OR "N-Phosphonomethylglycine" OR "Phorsat" OR "Phosphonomethylglycine" OR "Phosphonomethyliminoacetic acid" OR "Pondmaster" OR "Rebel Garden" OR "Roundup Max" OR "Safal" OR "Scout herbicide" OR "Silglif" OR "yerbimat") OR TX ("Roundup" AND (Monsanto)) OR MH ("antifungal agents")OR TX ("antifungal" OR "anti-fungal") OR MH ("enzyme inhibitors") OR TX ("enzyme" AND inhibitor*) OR TX ("enzyme inhibitors" OR "enzyme inhibitor")OR MH ("herbicides") OR TX ("herbicides" OR "herbicide") OR MH ("uncoupling agents") OR TX ("uncoupling" AND agent*) OR TX ("uncoupling agent" OR "uncoupling agents") OR MH ("pesticides" OR pesticide*))
SciFinder 9/2019	Substance Identifier "1071-83-6; 38641-94-0; Glyphos...">substances (27)>get references (19597)>refine "2017-2019" (2591)>refine "Clinical Trial Dissertation Jo..." (1111)>remove 198 references (913)

The results of the 2019 updated literature review were:

- Number of records identified (after duplicate removal): 2,636
- Number of records identified from government websites: 0
- Total number of records to undergo literature screening: 2,636

B.1.2 Literature Screening

A two-step process was used to screen the literature search to identify relevant studies on glyphosate:

- Title and abstract screen
- Full text screen

Title and Abstract Screen. Within the reference library, titles and abstracts were screened manually for relevance. Studies that were considered relevant (see Table B-1 for inclusion criteria) were moved to the second step of the literature screening process. Studies were excluded when the title and/or abstract clearly indicated that the study was not relevant to the toxicological profile.

2015/2017 literature review:

- Number of titles and abstracts screened: 5,803
- Number of studies considered relevant and moved to the next step: 628

2019 literature review

- Number of titles and abstracts screened: 2,636
- Number of studies considered relevant and moved to the next step: 135

Full Text Screen. The second step in the literature screening process was a full text review of individual studies considered relevant in the title and abstract screen step. Each study was reviewed to determine whether it was relevant for inclusion in the toxicological profile.

2015/2017 literature review:

- Number of studies undergoing full text review: 628
- Total number of studies cited in the profile: 329

2019 literature review:

- Number of studies undergoing full text review: 135
- Total number of studies cited in the profile: 60

A summary of the results of the literature search and screening is presented in Figure B- and Figure B-2..

Figure B-1. February 2015 and September 2017 Literature Search Results and Screen for Glyphosate

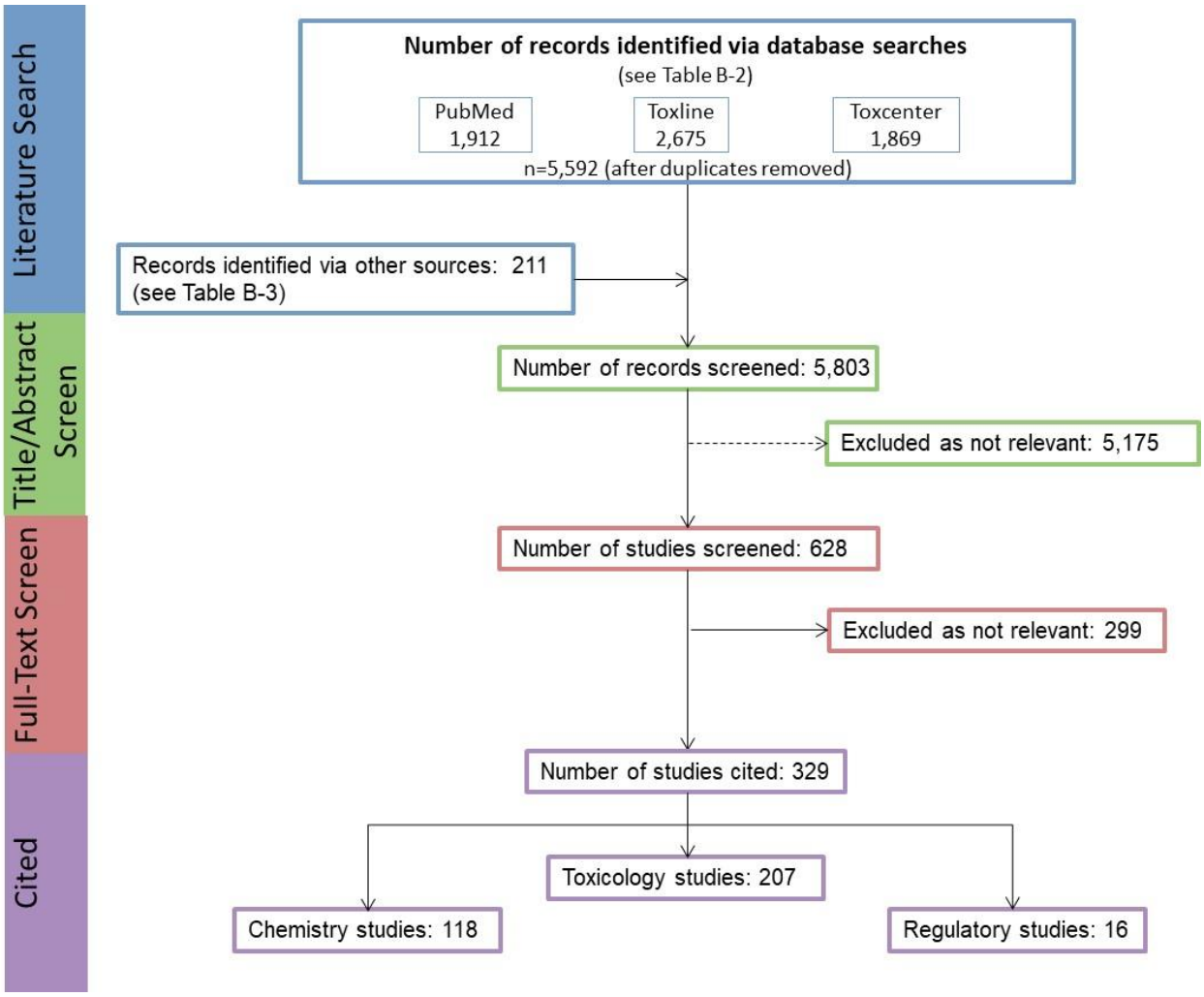
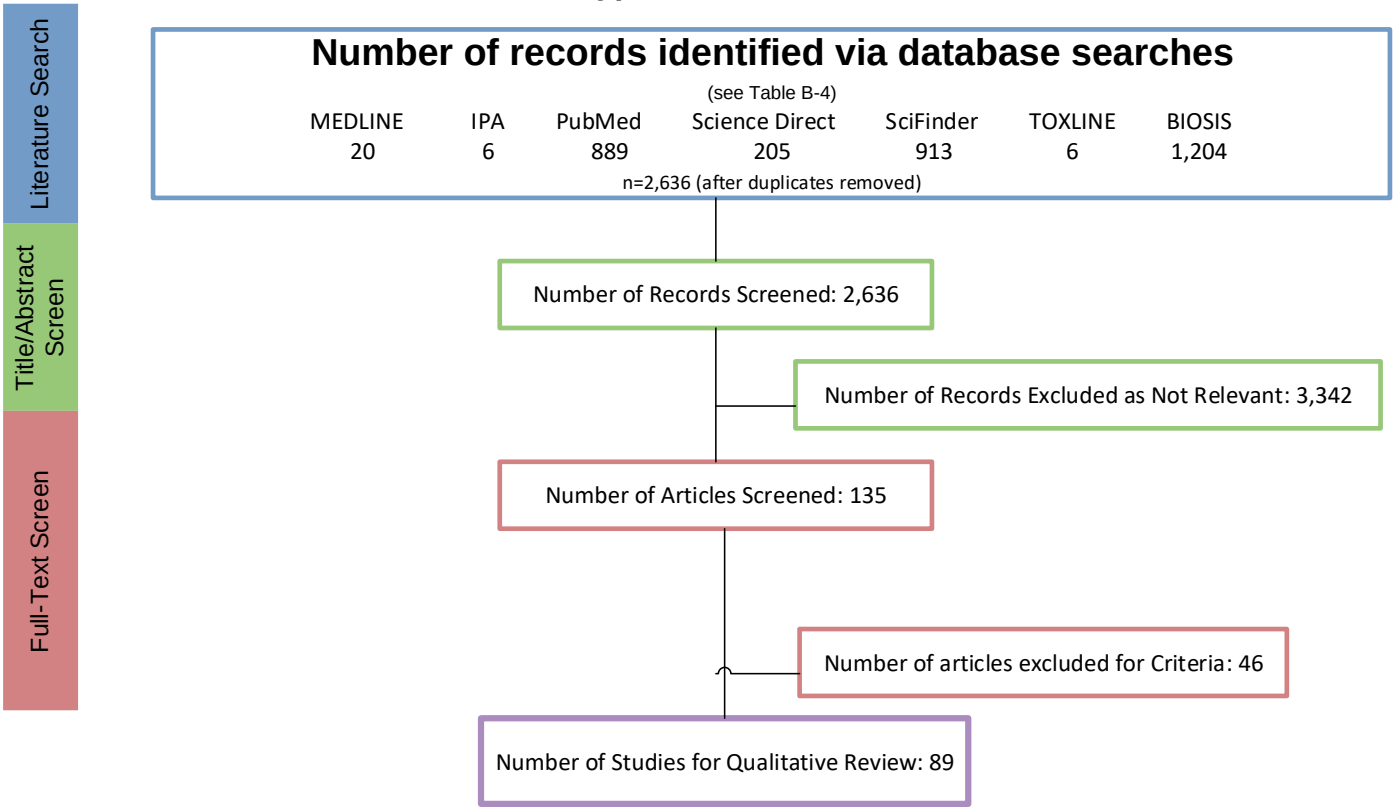


Figure B-2. September 2019 Supplemental Literature Search Results and Screen for Glyphosate



APPENDIX C. USER'S GUIDE

Chapter 1. Relevance to Public Health

This chapter provides an overview of U.S. exposures, a summary of health effects based on evaluations of existing toxicologic, epidemiologic, and toxicokinetic information, and an overview of the minimal risk levels. This is designed to present interpretive, weight-of-evidence discussions for human health endpoints by addressing the following questions:

1. What effects are known to occur in humans?

2. What effects observed in animals are likely to be of concern to humans?

3. What exposure conditions are likely to be of concern to humans, especially around hazardous waste sites?

Minimal Risk Levels (MRLs)

Where sufficient toxicologic information is available, ATSDR derives MRLs for inhalation and oral routes of entry at each duration of exposure (acute, intermediate, and chronic). These MRLs are not meant to support regulatory action, but to acquaint health professionals with exposure levels at which adverse health effects are not expected to occur in humans.

MRLs should help physicians and public health officials determine the safety of a community living near a hazardous substance emission, given the concentration of a contaminant in air or the estimated daily dose in water. MRLs are based largely on toxicological studies in animals and on reports of human occupational exposure.

MRL users should be familiar with the toxicologic information on which the number is based. Section 1.2, Summary of Health Effects, contains basic information known about the substance. Other sections, such as Section 3.2 Children and Other Populations that are Unusually Susceptible and Section 3.4 Interactions with Other Substances, provide important supplemental information.

MRL users should also understand the MRL derivation methodology. MRLs are derived using a modified version of the risk assessment methodology that the Environmental Protection Agency (EPA) provides (Barnes and Dourson 1988) to determine reference doses (RfDs) for lifetime exposure.

To derive an MRL, ATSDR generally selects the most sensitive endpoint which, in its best judgement, represents the most sensitive human health effect for a given exposure route and duration. ATSDR cannot make this judgement or derive an MRL unless information (quantitative or qualitative) is available for all potential systemic, neurological, and developmental effects. If this information and reliable quantitative data on the chosen endpoint are available, ATSDR derives an MRL using the most sensitive species (when information from multiple species is available) with the highest no-observed-adverse-effect level (NOAEL) that does not exceed any adverse effect levels. When a NOAEL is not available, a lowest-observed-adverse-effect level (LOAEL) can be used to derive an MRL, and an uncertainty factor of 10 must be employed. Additional uncertainty factors of 10 must be used both for human variability to protect sensitive subpopulations (people who are most susceptible to the health effects caused by the substance) and for interspecies variability (extrapolation from animals to humans). In deriving an MRL,

these individual uncertainty factors are multiplied together. The product is then divided into the inhalation concentration or oral dosage selected from the study. Uncertainty factors used in developing a substance-specific MRL are provided in the footnotes of the levels of significant exposure (LSE) tables that are provided in Chapter 2. Detailed discussions of the MRLs are presented in Appendix A.

Chapter 2. Health Effects

Tables and Figures for Levels of Significant Exposure (LSE)

Tables and figures are used to summarize health effects and illustrate graphically levels of exposure associated with those effects. These levels cover health effects observed at increasing dose concentrations and durations, differences in response by species and MRLs to humans for noncancer endpoints. The LSE tables and figures can be used for a quick review of the health effects and to locate data for a specific exposure scenario. The LSE tables and figures should always be used in conjunction with the text. All entries in these tables and figures represent studies that provide reliable, quantitative estimates of NOAELs, LOAELs, or Cancer Effect Levels (CELs).

The legends presented below demonstrate the application of these tables and figures. Representative examples of LSE tables and figures follow. The numbers in the left column of the legends correspond to the numbers in the example table and figure.

TABLE LEGEND

See Sample LSE Table (page C-5)

(1) Route of exposure. One of the first considerations when reviewing the toxicity of a substance using these tables and figures should be the relevant and appropriate route of exposure. Typically, when sufficient data exist, three LSE tables and two LSE figures are presented in the document. The three LSE tables present data on the three principal routes of exposure (i.e., inhalation, oral, and dermal). LSE figures are limited to the inhalation and oral routes. Not all substances will have data on each route of exposure and will not, therefore, have all five of the tables and figures. Profiles with more than one chemical may have more LSE tables and figures.

(2) Exposure period. Three exposure periods—acute (<15 days), intermediate (15–364 days), and chronic (≥365 days)—are presented within each relevant route of exposure. In this example, two oral studies of chronic-duration exposure are reported. For quick reference to health effects occurring from a known length of exposure, locate the applicable exposure period within the LSE table and figure.

(3) Figure key. Each key number in the LSE table links study information to one or more data points using the same key number in the corresponding LSE figure. In this example, the study represented by key number 51 identified NOAELs and less serious LOAELs (also see the three "51R" data points in sample LSE Figure 2-X).

(4) Species (strain) No./group. The test species (and strain), whether animal or human, are identified in this column. The column also contains information on the number of subjects and sex per group. Chapter 1, Relevance to Public Health, covers the relevance of animal data to human toxicity and Section 3.1, Toxicokinetics, contains any available information on comparative toxicokinetics. Although NOAELs and LOAELs are species specific, the levels are extrapolated to equivalent human doses to derive an MRL.

(5) Exposure parameters/doses. The duration of the study and exposure regimens are provided in these columns. This permits comparison of NOAELs and LOAELs from different studies. In this case (key number 51), rats were orally exposed to “Chemical X” via feed for 2 years. For a more complete review of the dosing regimen, refer to the appropriate sections of the text or the original reference paper (i.e., Aida et al. 1992).

(6) Parameters monitored. This column lists the parameters used to assess health effects. Parameters monitored could include serum (blood) chemistry (BC), behavioral (BH), biochemical changes (BI), body weight (BW), clinical signs (CS), developmental toxicity (DX), enzyme activity (EA), food intake (FI), fetal toxicity (FX), gross necropsy (GN), hematology (HE), histopathology (HP), lethality (LE), maternal toxicity (MX), organ function (OF), ophthalmology (OP), organ weight (OW), teratogenicity (TG), urinalysis (UR), and water intake (WI).

(7) Endpoint. This column lists the endpoint examined. The major categories of health endpoints included in LSE tables and figures are death, body weight, respiratory, cardiovascular, gastrointestinal, hematological, musculoskeletal, hepatic, renal, dermal, ocular, endocrine, immunological, neurological, reproductive, developmental, other noncancer, and cancer. "Other noncancer" refers to any effect (e.g., alterations in blood glucose levels) not covered in these systems. In the example of key number 51, three endpoints (body weight, hematological, and hepatic) were investigated.

(8) NOAEL. A NOAEL is the highest exposure level at which no adverse effects were seen in the organ system studied. The body weight effect reported in key number 51 is a NOAEL at 25.5 mg/kg/day. NOAELs are not reported for cancer and death; with the exception of these two endpoints, this field is left blank if no NOAEL was identified in the study.

(9) LOAEL. A LOAEL is the lowest dose used in the study that caused an adverse health effect. LOAELs have been classified into "Less Serious" and "Serious" effects. These distinctions help readers identify the levels of exposure at which adverse health effects first appear and the gradation of effects with increasing dose. A brief description of the specific endpoint used to quantify the adverse effect accompanies the LOAEL. Key number 51 reports a less serious LOAEL of 6.1 mg/kg/day for the hepatic system, which was used to derive a chronic exposure, oral MRL of 0.008 mg/kg/day (see footnote "c"). MRLs are not derived from serious LOAELs. A cancer effect level (CEL) is the lowest exposure level associated with the onset of carcinogenesis in experimental or epidemiologic studies. CELs are always considered serious effects. The LSE tables and figures do not contain NOAELs for cancer, but the text may report doses not causing measurable cancer increases. If no LOAEL/CEL values were identified in the study, this field is left blank.

(10) Reference. The complete reference citation is provided in Chapter 8 of the profile.

(11) Footnotes. Explanations of abbreviations or reference notes for data in the LSE tables are found in the footnotes. For example, footnote "c" indicates that the LOAEL of 6.1 mg/kg/day in key number 51 was used to derive an oral MRL of 0.008 mg/kg/day.

FIGURE LEGEND

See Sample LSE Figure (page C-6)

LSE figures graphically illustrate the data presented in the corresponding LSE tables. Figures help the reader quickly compare health effects according to exposure concentrations for particular exposure periods.

(13) Exposure period. The same exposure periods appear as in the LSE table. In this example, health effects observed within the chronic exposure period are illustrated.

(14) Endpoint. These are the categories of health effects for which reliable quantitative data exist. The same health effect endpoints appear in the LSE table.

(15) Levels of exposure. Concentrations or doses for each health effect in the LSE tables are graphically displayed in the LSE figures. Exposure concentration or dose is measured on the log scale "y" axis. Inhalation exposure is reported in mg/m^3 or ppm and oral exposure is reported in mg/kg/day.

(16) LOAEL. In this example, the half-shaded circle that is designated 51R identifies a LOAEL critical endpoint in the rat upon which a chronic oral exposure MRL is based. The key number 51 corresponds to the entry in the LSE table. The dashed descending arrow indicates the extrapolation from the exposure level of 6.1 mg/kg/day (see entry 51 in the sample LSE table) to the MRL of 0.008 mg/kg/day (see footnote "c" in the sample LSE table).

(17) CEL. Key number 59R is one of studies for which CELs were derived. The diamond symbol refers to a CEL for the test species (rat). The number 59 corresponds to the entry in the LSE table.

(18) Key to LSE figure. The key provides the abbreviations and symbols used in the figure.

APPENDIX C

Table 2-X. Levels of Significant Exposure to [Chemical X] – Oral (1)

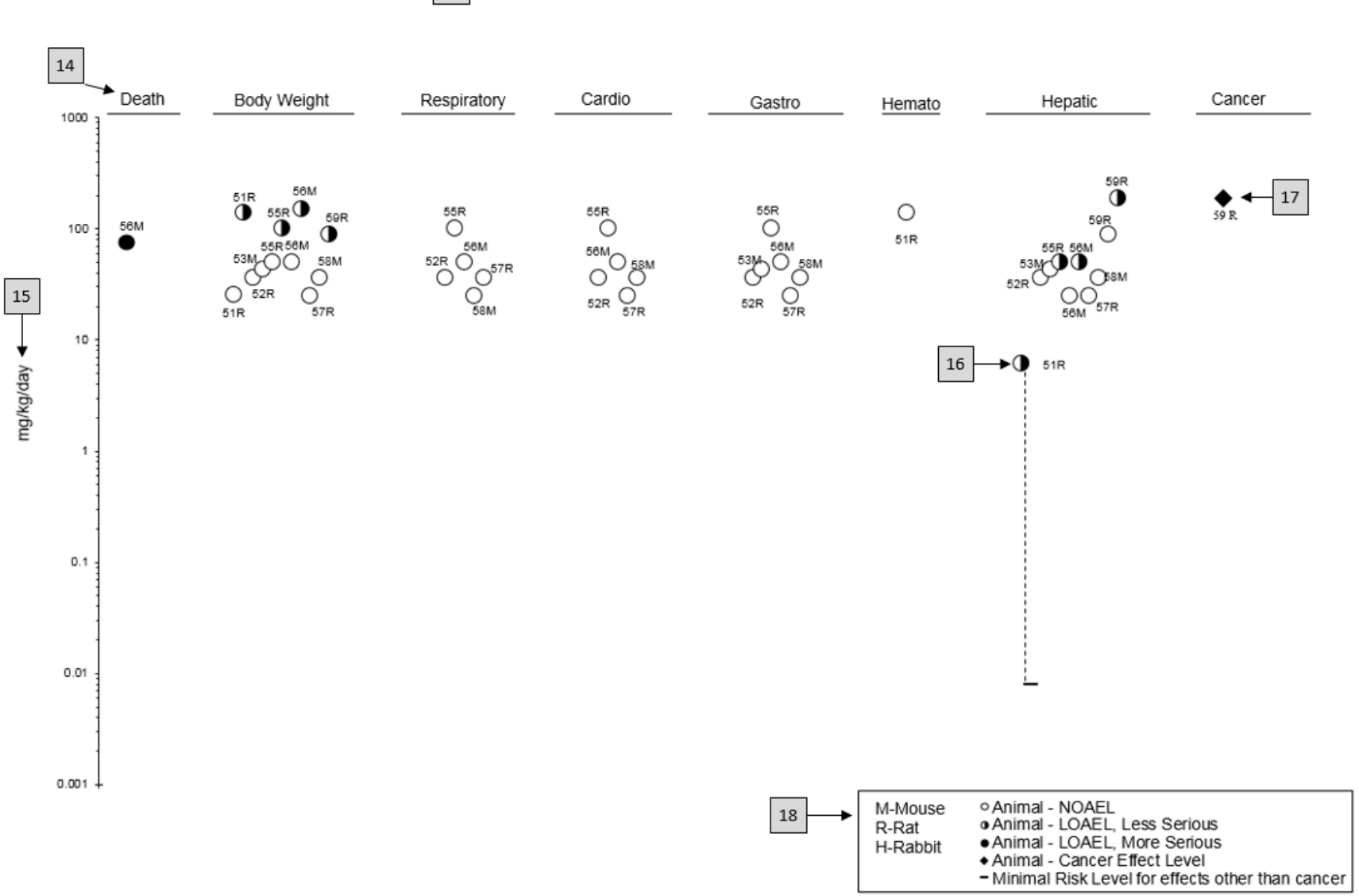
Figure key[a] (3)	Species (strain) No./group (4)	Exposure parameters (5)	Doses (mg/kg/day) (5)	Parameters monitored (6)	Endpoint (7)	NOAEL (mg/kg/day) (8)	Less serious LOAEL (mg/kg/day) (9)	Serious LOAEL (mg/kg/day) (9)	Effect
CHRONIC EXPOSURE (2)									
51	Rat (Wistar) 40 M, 40 F	2 years (F)	M: 0, 6.1, 25.5, 138.0 F: 0, 8.0, 31.7, 168.4	CS, WI, BW, OW, HE, BC, HP	Bd wt	25.5	138.0		Decreased body weight gain in males (23–25%) and females (31–39%)
					Hemato	138.0			
					Hepatic		6.1[c]		Increases in absolute and relative weights at ≥6.1/8.0 mg/kg/day after 12 months of exposure; fatty generation at ≥6.1 mg/kg/day in males and at ≥31.7 mg/kg/day in females, and granulomas in females at 31.7 and 168.4 mg/kg/day after 12, 18, or 24 months of exposure and in males at ≥6.1 mg/kg/day only after 24 months of exposure
Aida et al. 1992 (10)									
52	Rat (F344) 78 M	104 weeks (W)	0, 3.9, 20.6, 36.3	CS, BW, FI, BC, OW, HP	Hepatic	36.3			
					Renal	20.6	36.3		Increased incidence of renal tubular cell hyperplasia
					Endocr	36.3			
George et al. 2002									
59	Rat (Wistar) 58M, 58F	Lifetime (W)	M: 0, 90 F: 0, 190	BW, HP	Cancer		190 F		Increased incidence of hepatic neoplastic nodules in females only; no additional description of the tumors was provided
Tumasonis et al. 1985									

[a]The number corresponds to entries in Figure 2-x.

(11) [b]Used to derive an acute-duration oral minimal risk level (MRL) of 0.1 mg/kg/day based on the $BMDL_{05}$ of 10 mg/kg/day and an uncertainty factor of 100 (10 for extrapolation from animals to humans and 10 for human variability).

[c]Used to derive a chronic-duration oral MRL of 0.008 mg/kg/day based on the $BMDL_{10}$ of 0.78 mg/kg/day and an uncertainty factor of 100 (10 for extrapolation from animals to humans and 10 for human variability).

Figure 2-X. Levels of Significant Exposure to [Chemical X] - Oral



APPENDIX D. QUICK REFERENCE FOR HEALTH CARE PROVIDERS

Toxicological Profiles are a unique compilation of toxicological information on a given hazardous substance. Each profile reflects a comprehensive and extensive evaluation, summary, and interpretation of available toxicologic and epidemiologic information on a substance. Health care providers treating patients potentially exposed to hazardous substances may find the following information helpful for fast answers to often-asked questions.

Primary Chapters/Sections of Interest

Chapter 1: Relevance to Public Health: The Relevance to Public Health Section provides an overview of exposure and health effects and evaluates, interprets, and assesses the significance of toxicity data to human health. A table listing minimal risk levels (MRLs) is also included in this chapter.

Chapter 2: Health Effects: Specific health effects identified in both human and animal studies are reported by type of health effect (e.g., death, hepatic, renal, immune, reproductive), route of exposure (e.g., inhalation, oral, dermal), and length of exposure (e.g., acute, intermediate, and chronic).
NOTE: Not all health effects reported in this section are necessarily observed in the clinical setting.

Pediatrics:

Section 3.2 Children and Other Populations that are Unusually Susceptible
Section 3.3 Biomarkers of Exposure and Effect

ATSDR Information Center

Phone: 1-800-CDC-INFO (800-232-4636) or 1-888-232-6348 (TTY)
Internet: http://www.atsdr.cdc.gov

The following additional materials are available online:

Case Studies in Environmental Medicine are self-instructional publications designed to increase primary health care providers' knowledge of a hazardous substance in the environment and to aid in the evaluation of potentially exposed patients (see https://www.atsdr.cdc.gov/csem/csem.html).

Managing Hazardous Materials Incidents is a three-volume set of recommendations for on-scene (prehospital) and hospital medical management of patients exposed during a hazardous materials incident (see https://www.atsdr.cdc.gov/MHMI/index.asp). Volumes I and II are planning guides to assist first responders and hospital emergency department personnel in planning for incidents that involve hazardous materials. Volume III—*Medical Management Guidelines for Acute Chemical Exposures*—is a guide for health care professionals treating patients exposed to hazardous materials.

Fact Sheets (ToxFAQs™) provide answers to frequently asked questions about toxic substances (see https://www.atsdr.cdc.gov/toxfaqs/Index.asp).

Other Agencies and Organizations

The National Center for Environmental Health (NCEH) focuses on preventing or controlling disease, injury, and disability related to the interactions between people and their environment outside the workplace. Contact: NCEH, Mailstop F-29, 4770 Buford Highway, NE, Atlanta, GA 30341-3724 • Phone: 770-488-7000 • FAX: 770-488-7015 • Web Page: https://www.cdc.gov/nceh/.

The National Institute for Occupational Safety and Health (NIOSH) conducts research on occupational diseases and injuries, responds to requests for assistance by investigating problems of health and safety in the workplace, recommends standards to the Occupational Safety and Health Administration (OSHA) and the Mine Safety and Health Administration (MSHA), and trains professionals in occupational safety and health. Contact: NIOSH, 395 E Street, S.W., Suite 9200, Patriots Plaza Building, Washington, DC 20201 • Phone: 202-245-0625 or 1-800-CDC-INFO (800-232-4636) • Web Page: https://www.cdc.gov/niosh/.

The National Institute of Environmental Health Sciences (NIEHS) is the principal federal agency for biomedical research on the effects of chemical, physical, and biologic environmental agents on human health and well-being. Contact: NIEHS, PO Box 12233, 104 T.W. Alexander Drive, Research Triangle Park, NC 27709 • Phone: 919-541-3212 • Web Page: https://www.niehs.nih.gov/.

Clinical Resources (Publicly Available Information)

The Association of Occupational and Environmental Clinics (AOEC) has developed a network of clinics in the United States to provide expertise in occupational and environmental issues. Contact: AOEC, 1010 Vermont Avenue, NW, #513, Washington, DC 20005 • Phone: 202-347-4976 • FAX: 202-347-4950 • e-mail: AOEC@AOEC.ORG • Web Page: http://www.aoec.org/.

The American College of Occupational and Environmental Medicine (ACOEM) is an association of physicians and other health care providers specializing in the field of occupational and environmental medicine. Contact: ACOEM, 25 Northwest Point Boulevard, Suite 700, Elk Grove Village, IL 60007-1030 • Phone: 847-818-1800 • FAX: 847-818-9266 • Web Page: http://www.acoem.org/.

The American College of Medical Toxicology (ACMT) is a nonprofit association of physicians with recognized expertise in medical toxicology. Contact: ACMT, 10645 North Tatum Boulevard, Suite 200-111, Phoenix AZ 85028 • Phone: 844-226-8333 • FAX: 844-226-8333 • Web Page: http://www.acmt.net.

The Pediatric Environmental Health Specialty Units (PEHSUs) is an interconnected system of specialists who respond to questions from public health professionals, clinicians, policy makers, and the public about the impact of environmental factors on the health of children and reproductive-aged adults. Contact information for regional centers can be found at http://pehsu.net/findhelp.html.

The American Association of Poison Control Centers (AAPCC) provide support on the prevention and treatment of poison exposures. Contact: AAPCC, 515 King Street, Suite 510, Alexandria VA 22314 • Phone: 701-894-1858 • Poison Help Line: 1-800-222-1222 • Web Page: http://www.aapcc.org/.

APPENDIX E. GLOSSARY

Absorption—The process by which a substance crosses biological membranes and enters systemic circulation. Absorption can also refer to the taking up of liquids by solids, or of gases by solids or liquids.

Acute Exposure—Exposure to a chemical for a duration of ≤14 days, as specified in the Toxicological Profiles.

Adsorption—The adhesion in an extremely thin layer of molecules (as of gases, solutes, or liquids) to the surfaces of solid bodies or liquids with which they are in contact.

Adsorption Coefficient (K_{oc})—The ratio of the amount of a chemical adsorbed per unit weight of organic carbon in the soil or sediment to the concentration of the chemical in solution at equilibrium.

Adsorption Ratio (Kd)—The amount of a chemical adsorbed by sediment or soil (i.e., the solid phase) divided by the amount of chemical in the solution phase, which is in equilibrium with the solid phase, at a fixed solid/solution ratio. It is generally expressed in micrograms of chemical sorbed per gram of soil or sediment.

Benchmark Dose (BMD) or Benchmark Concentration (BMC)—is the dose/concentration corresponding to a specific response level estimate using a statistical dose-response model applied to either experimental toxicology or epidemiology data. For example, a BMD_{10} would be the dose corresponding to a 10% benchmark response (BMR). The BMD is determined by modeling the dose-response curve in the region of the dose-response relationship where biologically observable data are feasible. The BMDL or BMCL is the 95% lower confidence limit on the BMD or BMC.

Bioconcentration Factor (BCF)—The quotient of the concentration of a chemical in aquatic organisms at a specific time or during a discrete time period of exposure divided by the concentration in the surrounding water at the same time or during the same period.

Biomarkers—Indicators signaling events in biologic systems or samples, typically classified as markers of exposure, effect, and susceptibility.

Cancer Effect Level (CEL)—The lowest dose of a chemical in a study, or group of studies, that produces significant increases in the incidence of cancer (or tumors) between the exposed population and its appropriate control.

Carcinogen—A chemical capable of inducing cancer.

Case-Control Study—A type of epidemiological study that examines the relationship between a particular outcome (disease or condition) and a variety of potential causative agents (such as toxic chemicals). In a case-control study, a group of people with a specified and well-defined outcome is identified and compared to a similar group of people without the outcome.

Case Report—A report that describes a single individual with a particular disease or exposure. These reports may suggest some potential topics for scientific research, but are not actual research studies.

Case Series—Reports that describe the experience of a small number of individuals with the same disease or exposure. These reports may suggest potential topics for scientific research, but are not actual research studies.

Ceiling Value—A concentration that must not be exceeded.

Chronic Exposure—Exposure to a chemical for ≥365 days, as specified in the Toxicological Profiles.

Clastogen—A substance that causes breaks in chromosomes resulting in addition, deletion, or rearrangement of parts of the chromosome.

Cohort Study—A type of epidemiological study of a specific group or groups of people who have had a common insult (e.g., exposure to an agent suspected of causing disease or a common disease) and are followed forward from exposure to outcome, and who are disease-free at start of follow-up. Often, at least one exposed group is compared to one unexposed group, while in other cohorts, exposure is a continuous variable and analyses are directed towards analyzing an exposure-response coefficient.

Cross-sectional Study—A type of epidemiological study of a group or groups of people that examines the relationship between exposure and outcome to a chemical or to chemicals at a specific point in time.

Data Needs—Substance-specific informational needs that, if met, would reduce the uncertainties of human health risk assessment.

Developmental Toxicity—The occurrence of adverse effects on the developing organism that may result from exposure to a chemical prior to conception (either parent), during prenatal development, or postnatally to the time of sexual maturation. Adverse developmental effects may be detected at any point in the life span of the organism.

Dose-Response Relationship—The quantitative relationship between the amount of exposure to a toxicant and the incidence of the response or amount of the response.

Embryotoxicity and Fetotoxicity—Any toxic effect on the conceptus as a result of prenatal exposure to a chemical; the distinguishing feature between the two terms is the stage of development during which the effect occurs. Effects include malformations and variations, altered growth, and *in utero* death.

Epidemiology—The investigation of factors that determine the frequency and distribution of disease or other health-related conditions within a defined human population during a specified period.

Excretion—The process by which metabolic waste products are removed from the body.

Genotoxicity—A specific adverse effect on the genome of living cells that, upon the duplication of affected cells, can be expressed as a mutagenic, clastogenic, or carcinogenic event because of specific alteration of the molecular structure of the genome.

Half-life—A measure of rate for the time required to eliminate one-half of a quantity of a chemical from the body or environmental media.

Health Advisory—An estimate of acceptable drinking water levels for a chemical substance derived by EPA and based on health effects information. A health advisory is not a legally enforceable federal standard, but serves as technical guidance to assist federal, state, and local officials.

Immediately Dangerous to Life or Health (IDLH)—A condition that poses a threat of life or health, or conditions that pose an immediate threat of severe exposure to contaminants that are likely to have adverse cumulative or delayed effects on health.

Immunotoxicity—Adverse effect on the functioning of the immune system that may result from exposure to chemical substances.

Incidence—The ratio of new cases of individuals in a population who develop a specified condition to the total number of individuals in that population who could have developed that condition in a specified time period.

Intermediate Exposure—Exposure to a chemical for a duration of 15–364 days, as specified in the Toxicological Profiles.

***In Vitro*—**Isolated from the living organism and artificially maintained, as in a test tube.

***In Vivo*—**Occurring within the living organism.

Lethal Concentration$_{(LO)}$ (LC_{LO})—The lowest concentration of a chemical in air that has been reported to have caused death in humans or animals.

Lethal Concentration$_{(50)}$ (LC_{50})—A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

Lethal Dose$_{(LO)}$ (LD_{Lo})—The lowest dose of a chemical introduced by a route other than inhalation that has been reported to have caused death in humans or animals.

Lethal Dose$_{(50)}$ (LD_{50})—The dose of a chemical that has been calculated to cause death in 50% of a defined experimental animal population.

Lethal Time$_{(50)}$ (LT_{50})—A calculated period of time within which a specific concentration of a chemical is expected to cause death in 50% of a defined experimental animal population.

Lowest-Observed-Adverse-Effect Level (LOAEL)—The lowest exposure level of chemical in a study, or group of studies, that produces statistically or biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control.

Lymphoreticular Effects—Represent morphological effects involving lymphatic tissues such as the lymph nodes, spleen, and thymus.

Malformations—Permanent structural changes that may adversely affect survival, development, or function.

Metabolism—Process in which chemical substances are biotransformed in the body that could result in less toxic and/or readily excreted compounds or produce a biologically active intermediate.

Minimal Risk Level (MRL)—An estimate of daily human exposure to a hazardous substance that is likely to be without an appreciable risk of adverse noncancer health effects over a specified route and duration of exposure.

Modifying Factor (MF)—A value (greater than zero) that is applied to the derivation of a Minimal Risk Level (MRL) to reflect additional concerns about the database that are not covered by the uncertainty factors. The default value for a MF is 1.

Morbidity—The state of being diseased; the morbidity rate is the incidence or prevalence of a disease in a specific population.

Mortality—Death; the mortality rate is a measure of the number of deaths in a population during a specified interval of time.

Mutagen—A substance that causes mutations, which are changes in the DNA sequence of a cell's DNA. Mutations can lead to birth defects, miscarriages, or cancer.

Necropsy—The gross examination of the organs and tissues of a dead body to determine the cause of death or pathological conditions.

Neurotoxicity—The occurrence of adverse effects on the nervous system following exposure to a hazardous substance.

No-Observed-Adverse-Effect Level (NOAEL)—The dose of a chemical at which there were no statistically or biologically significant increases in frequency or severity of adverse effects seen between the exposed population and its appropriate control. Although effects may be produced at this dose, they are not considered to be adverse.

Octanol-Water Partition Coefficient (K_{ow})—The equilibrium ratio of the concentrations of a chemical in *n*-octanol and water, in dilute solution.

Odds Ratio (OR)—A means of measuring the association between an exposure (such as toxic substances and a disease or condition) that represents the best estimate of relative risk (risk as a ratio of the incidence among subjects exposed to a particular risk factor divided by the incidence among subjects who were not exposed to the risk factor). An odds ratio that is greater than 1 is considered to indicate greater risk of disease in the exposed group compared to the unexposed group.

Permissible Exposure Limit (PEL)—An Occupational Safety and Health Administration (OSHA) regulatory limit on the amount or concentration of a substance not to be exceeded in workplace air averaged over any 8-hour work shift of a 40-hour workweek.

Pesticide—General classification of chemicals specifically developed and produced for use in the control of agricultural and public health pests (insects or other organisms harmful to cultivated plants or animals).

Pharmacokinetics—The dynamic behavior of a material in the body, used to predict the fate (disposition) of an exogenous substance in an organism. Utilizing computational techniques, it provides the means of studying the absorption, distribution, metabolism, and excretion of chemicals by the body.

Pharmacokinetic Model—A set of equations that can be used to describe the time course of a parent chemical or metabolite in an animal system. There are two types of pharmacokinetic models: data-based and physiologically-based. A data-based model divides the animal system into a series of compartments, which, in general, do not represent real, identifiable anatomic regions of the body, whereas the physiologically-based model compartments represent real anatomic regions of the body.

Physiologically Based Pharmacodynamic (PBPD) Model—A type of physiologically based dose-response model that quantitatively describes the relationship between target tissue dose and toxic endpoints. These models advance the importance of physiologically based models in that they clearly describe the biological effect (response) produced by the system following exposure to an exogenous substance.

Physiologically Based Pharmacokinetic (PBPK) Model—A type of physiologically based dose-response model that is comprised of a series of compartments representing organs or tissue groups with realistic weights and blood flows. These models require a variety of physiological information, including tissue volumes, blood flow rates to tissues, cardiac output, alveolar ventilation rates, and possibly membrane permeabilities. The models also utilize biochemical information, such as blood:air partition coefficients, and metabolic parameters. PBPK models are also called biologically based tissue dosimetry models.

Prevalence—The number of cases of a disease or condition in a population at one point in time.

Prospective Study—A type of cohort study in which a group is followed over time and the pertinent observations are made on events occurring after the start of the study.

Recommended Exposure Limit (REL)—A National Institute for Occupational Safety and Health (NIOSH) time-weighted average (TWA) concentration for up to a 10-hour workday during a 40-hour workweek.

Reference Concentration (RfC)—An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious noncancer health effects during a lifetime. The inhalation RfC is expressed in units of mg/m^3 or ppm.

Reference Dose (RfD)—An estimate (with uncertainty spanning perhaps an order of magnitude) of the daily oral exposure of the human population to a potential hazard that is likely to be without risk of deleterious noncancer health effects during a lifetime. The oral RfD is expressed in units of mg/kg/day.

Reportable Quantity (RQ)—The quantity of a hazardous substance that is considered reportable under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). RQs are (1) $\geq$1 pound or (2) for selected substances, an amount established by regulation either under CERCLA or under Section 311 of the Clean Water Act. Quantities are measured over a 24-hour period.

Reproductive Toxicity—The occurrence of adverse effects on the reproductive system that may result from exposure to a hazardous substance. The toxicity may be directed to the reproductive organs and/or the related endocrine system. The manifestation of such toxicity may be noted as alterations in sexual behavior, fertility, pregnancy outcomes, or modifications in other functions that are dependent on the integrity of this system.

Retrospective Study—A type of cohort study based on a group of persons known to have been exposed at some time in the past. Data are collected from routinely recorded events, up to the time the study is undertaken. Retrospective studies are limited to causal factors that can be ascertained from existing records and/or examining survivors of the cohort.

Risk—The possibility or chance that some adverse effect will result from a given exposure to a hazardous substance.

Risk Factor—An aspect of personal behavior or lifestyle, an environmental exposure, existing health condition, or an inborn or inherited characteristic that is associated with an increased occurrence of disease or other health-related event or condition.

Risk Ratio/Relative Risk—The ratio of the risk among persons with specific risk factors compared to the risk among persons without risk factors. A risk ratio that is greater than 1 indicates greater risk of disease in the exposed group compared to the unexposed group.

Short-Term Exposure Limit (STEL)—A STEL is a 15-minute TWA exposure that should not be exceeded at any time during a workday.

Standardized Mortality Ratio (SMR)—A ratio of the observed number of deaths and the expected number of deaths in a specific standard population.

Target Organ Toxicity—This term covers a broad range of adverse effects on target organs or physiological systems (e.g., renal, cardiovascular) extending from those arising through a single limited exposure to those assumed over a lifetime of exposure to a chemical.

Teratogen—A chemical that causes structural defects that affect the development of an organism.

Threshold Limit Value (TLV)—An American Conference of Governmental Industrial Hygienists (ACGIH) concentration of a substance to which it is believed that nearly all workers may be repeatedly exposed, day after day, for a working lifetime without adverse effect. The TLV may be expressed as a Time-Weighted Average (TLV-TWA), as a Short-Term Exposure Limit (TLV-STEL), or as a ceiling limit (TLV-C).

Time-Weighted Average (TWA)—An average exposure within a given time period.

Toxicokinetic—The absorption, distribution, metabolism, and elimination of toxic compounds in the living organism.

Toxics Release Inventory (TRI)—The TRI is an EPA program that tracks toxic chemical releases and pollution prevention activities reported by industrial and federal facilities.

Uncertainty Factor (UF)—A factor used in operationally deriving the Minimal Risk Level (MRL), Reference Dose (RfD), or Reference Concentration (RfC) from experimental data. UFs are intended to account for (1) the variation in sensitivity among the members of the human population, (2) the uncertainty in extrapolating animal data to the case of human, (3) the uncertainty in extrapolating from data obtained in a study that is of less than lifetime exposure, and (4) the uncertainty in using lowest-observed-adverse-effect level (LOAEL) data rather than no-observed-adverse-effect level (NOAEL) data. A default for each individual UF is 10; if complete certainty in data exists, a value of 1 can be used; however, a reduced UF of 3 may be used on a case-by-case basis (3 being the approximate logarithmic average of 10 and 1).

Xenobiotic—Any substance that is foreign to the biological system.

APPENDIX F. ACRONYMS, ABBREVIATIONS, AND SYMBOLS

AAPCC	American Association of Poison Control Centers
ACGIH	American Conference of Governmental Industrial Hygienists
ACOEM	American College of Occupational and Environmental Medicine
ACMT	American College of Medical Toxicology
ADI	acceptable daily intake
ADME	absorption, distribution, metabolism, and excretion
AEGL	Acute Exposure Guideline Level
AIC	Akaike's information criterion
AIHA	American Industrial Hygiene Association
ALT	alanine aminotransferase
AOEC	Association of Occupational and Environmental Clinics
AP	alkaline phosphatase
AST	aspartate aminotransferase
atm	atmosphere
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BCF	bioconcentration factor
BMD/C	benchmark dose or benchmark concentration
BMD_X	dose that produces a X% change in response rate of an adverse effect
$BMDL_X$	95% lower confidence limit on the BMD_X
BMDS	Benchmark Dose Software
BMR	benchmark response
BUN	blood urea nitrogen
C	centigrade
CAA	Clean Air Act
CAS	Chemical Abstract Services
CDC	Centers for Disease Control and Prevention
CEL	cancer effect level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Ci	curie
CI	confidence interval
cm	centimeter
CPSC	Consumer Products Safety Commission
CWA	Clean Water Act
DHHS	Department of Health and Human Services
DNA	deoxyribonucleic acid
DOD	Department of Defense
DOE	Department of Energy
DWEL	drinking water exposure level
EAFUS	Everything Added to Food in the United States
ECG/EKG	electrocardiogram
EEG	electroencephalogram
EPA	Environmental Protection Agency
ERPG	emergency response planning guidelines
F	Fahrenheit
F1	first-filial generation
FDA	Food and Drug Administration

FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
FSH	follicle stimulating hormone
g	gram
GC	gas chromatography
gd	gestational day
GGT	γ-glutamyl transferase
GRAS	generally recognized as safe
HEC	human equivalent concentration
HED	human equivalent dose
HHS	Department of Health and Human Services
HPLC	high-performance liquid chromatography
HSDB	Hazardous Substance Data Bank
IARC	International Agency for Research on Cancer
IDLH	immediately dangerous to life and health
IRIS	Integrated Risk Information System
Kd	adsorption ratio
kg	kilogram
kkg	kilokilogram; 1 kilokilogram is equivalent to 1,000 kilograms and 1 metric ton
K_{oc}	organic carbon partition coefficient
K_{ow}	octanol-water partition coefficient
L	liter
LC	liquid chromatography
LC_{50}	lethal concentration, 50% kill
LC_{Lo}	lethal concentration, low
LD_{50}	lethal dose, 50% kill
LD_{Lo}	lethal dose, low
LDH	lactic dehydrogenase
LH	luteinizing hormone
LOAEL	lowest-observed-adverse-effect level
LSE	Level of Significant Exposure
LT_{50}	lethal time, 50% kill
m	meter
mCi	millicurie
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MF	modifying factor
mg	milligram
mL	milliliter
mm	millimeter
mmHg	millimeters of mercury
mmol	millimole
MRL	Minimal Risk Level
MS	mass spectrometry
MSHA	Mine Safety and Health Administration
Mt	metric ton
NAAQS	National Ambient Air Quality Standard
NAS	National Academy of Science
NCEH	National Center for Environmental Health
ND	not detected
ng	nanogram

NHANES	National Health and Nutrition Examination Survey
NIEHS	National Institute of Environmental Health Sciences
NIOSH	National Institute for Occupational Safety and Health
NLM	National Library of Medicine
nm	nanometer
nmol	nanomole
NOAEL	no-observed-adverse-effect level
NPL	National Priorities List
NR	not reported
NRC	National Research Council
NS	not specified
NTP	National Toxicology Program
OR	odds ratio
OSHA	Occupational Safety and Health Administration
PAC	Protective Action Criteria
PAH	polycyclic aromatic hydrocarbon
PBPD	physiologically based pharmacodynamic
PBPK	physiologically based pharmacokinetic
PEL	permissible exposure limit
PEL-C	permissible exposure limit-ceiling value
pg	picogram
PEHSU	Pediatric Environmental Health Specialty Unit
PND	postnatal day
POD	point of departure
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
ppt	parts per trillion
REL	recommended exposure level/limit
REL-C	recommended exposure level-ceiling value
RfC	reference concentration
RfD	reference dose
RNA	ribonucleic acid
SARA	Superfund Amendments and Reauthorization Act
SCE	sister chromatid exchange
SD	standard deviation
SE	standard error
SGOT	serum glutamic oxaloacetic transaminase (same as aspartate aminotransferase or AST)
SGPT	serum glutamic pyruvic transaminase (same as alanine aminotransferase or ALT)
SIC	standard industrial classification
SMR	standardized mortality ratio
sRBC	sheep red blood cell
STEL	short term exposure limit
TLV	threshold limit value
TLV-C	threshold limit value-ceiling value
TRI	Toxics Release Inventory
TSCA	Toxic Substances Control Act
TWA	time-weighted average
UF	uncertainty factor
U.S.	United States
USDA	United States Department of Agriculture

USGS	United States Geological Survey
USNRC	U.S. Nuclear Regulatory Commission
VOC	volatile organic compound
WBC	white blood cell
WHO	World Health Organization

>	greater than
≥	greater than or equal to
=	equal to
<	less than
≤	less than or equal to
%	percent
α	alpha
β	beta
γ	gamma
δ	delta
μm	micrometer
μg	microgram
q_1^*	cancer slope factor
–	negative
+	positive
(+)	weakly positive result
(–)	weakly negative result