Table S1. Bacterial Reverse Mutation Assays Cited by EPA 2016 or IARC 2017

Studies on Glyphosate Technical

Year	Author	Test Type/System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1978	Flowers and Kier [MRID 00078620]	*S. typhimurium* (4 strains)	Negative ± S9	98.40%			x			x			
1978	Shirasu et al. [MRID 00078619]	*S. typhimurium* (5 strains), *E. coli* (1 strain)	Negative ± S9	98.40%			x			x		Published in Li and Long, 1988	
1982	Wilderman and Nazar	*S. typhimurium* (2 strains)	Negative ± S9	Not reported in EPA analysis				x			x	Rat S9 and plant cell-free homogenate were used for metabolic activation	Wildeman and Nazar 1982
1982	Majeska et al. [MRID 00126612]	*S. typhimurium* (5 strains)	Negative ± S9	90% glyphosate trimesium salt			x			x			
1983	Moriya et al.	*S. typhimurium* (5 strains)	Negative ± S9	Not reported in EPA analysis				x			x		Moriya et al. 1983
1985	Majeska et al. [MRID 00155527]	*S. typhimurium* (4 strains)	Negative ± S9	55.6% glyphosate trimesium salt			x			x			
1991	Jensen [MRID 49961502]	*S. typhimurium* (4 strains)	Negative ± S9	98.60%			x			x			
1992	Chan and Mahler	*S. typhimurium* (4 strains)	Negative ± S9	99%				x	x		x	Hamster and rat S9	Chan and Mahler 1992
1993	Suresh	*S. typhimurium* (5 strains)	Negative ± S9	96.00%		x	x			x			
1995	Akanuma [MRID 50017102]	*S. typhimurium* (5 strains)	Negative ± S9	98.68%			x			x			
1996	Callander [MRID 44320617]	*S. typhimurium* (4 strains), *E. coli* (2 strains)	Negative ± S9	98.6% glyphosate acid			x			x			
1996	Thompson [MRID 49957409]	*S. typhimurium* (4 strains), *E. coli* (1 strain)	Negative ± S9	95.30%			x			x			
1999	Callander	*S. typhimurium* (4 strains), *E. coli* (2 strains)	Negative ± S9	60% potassium glyphosate salt		x	x			x			
2000	Chruscielska et al.	*S. typhimurium* (4 strains)	Negative ± S9	Not reported in EPA analysis				x	x		x		Chruscielska et al. 2000
2000	Ranzani	*Salmonella typhimurium* (4 strains)	Negative ± S9	61.27% glyphosate isopropylamine salt		x	x			x			
2007	Ribeiro do Val [MRID 50000903]	*S. typhimurium* (5 strains)	Negative ± S9	98.01%			x			x			
2007	Sokolowski [MRID 49957406]	*S. typhimurium* (4 strains), *E. coli* (1 strain)	Negative ± S9	95.10%			x			x			
2007	Sokolowski [MRID 49957407]	*S. typhimurium* (4 strains), *E. coli* (1 strain)	Negative ± S9	97.70%			x			x			
2007	Sokolowski [MRID 49957408]	*S. typhimurium* (4 strains), *E. coli* (1 strain)	Negative ± S9	95.00%			x			x			
2008	Miyaji	*S. typhimurium* (5 strains)	Negative ± S9	98.05%		x	x			x			
2009	Flügge	*S. typhimurium* (5 strains)	Negative ± S9	98.80%		x	x			x			
2009	Sokolowski	*S. typhimurium* (4 strains), *E. coli* (1 strain)	Negative ± S9	96.66%		x	x			x			
2009	Sokolowski [MRID 49961801]	*S. typhimurium* (4 strains), *E. coli* (2 strains)	Negative ± S9	96.3% glyphosate acid			x			x			
2010	Flügge	*S. typhimurium* (5 strains)	Negative ± S9	96.40%		x	x			x			
2010	Schreib	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative ± S9	96.00%		x	x			x			
2010	Sokolowski [MRID 50000902]	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative ± S9	97.16%			x			x			
2010	Wallner	*S. typhimurium* (5 strains)	Negative ± S9	98.20%		x	x			x			
Summary Statistics: Glyphosate Technical				**Totals**			**23**	**4**	**2**	**23**	**4**		
				Number Positive* **			**0**	**0**	**0**	**0**	**0**		
				Percent Positive			**0%**	**0%**	**0%**	**0%**	**0%**		

Studies on Formulated GBHs

Year	Author	Test Type/System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1981	Flowers	*S. typhimurium* (5 strains)	Negative ± S9		MON 8080 (87.6%)		x			x			
1982	Majeska	*S. typhimurium* (5 strains)	Negative ± S9		MON 79672 (Roundup Ultramax)74.7% monoammonium glyphosate salt; 68.2% glyphosate		x			x			
1988	Callander	*S. typhimurium* (5 strains), *Escherichia coli* (1 strain)	Negative ± S9		ICIA 0224 57.6% in water		x			x			
1992	Kier et al.	*S. typhimurium* (4 strains)	Negative ± S9		Rodeo® (IPA salt and water only), 40% glyphosate (acid equivalent)		x			x			
1992	Kier et al.	*S. typhimurium* (4 strains)	Negative ± S9		MON 2139 (Roundup®), 31% glyphosate (acid equivalent)		x			x		Cytotoxic at top concentrations	
1992	Kier et al.	*S. typhimurium* (4 strains)	Negative ± S9		MON 14445(Direct®), 75% glyphosate (acid equivalent)		x			x		Cytotoxic at top concentrations, occasionally at lower concentrations	
1993	Callander	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative ± S9		TMSC (tri-methyl-sulfonium chloride) 95% purity		x			x			
1993	Rank et al.	*S. typhimurium* (1 strain)	Negative –S9, Equivocal +S9		Roundup, 480 g/L glyphosate isopropylamine salt			x	x		x		Rank et al. 1993
1993	Rank et al.	*S. typhimurium* (1 strain)	Positive		Not reported in IARC 112.			x	x		x		Rank et al. 1993
1993	Wang et al.	*S. typhimurium* (1 strain)	Negative ± S9		64% glyphosate isopropylammonium salt		x			x			
1996	Vargas	*S. typhimurium* (4 strains)	Negative ± S9		Glifos formulation (glyphosate isopropylammonium salt, Berol 907, water)		x			x		Cytotoxic at two upper concentrations	
1998	Gava	*S. typhimurium* (4 strains)	Negative ± S9		Roundup WG 784 g/kg ammonium salt equivalent		x			x			
1998	Perina	*S. typhimurium* (4 strains)	Negative		MON 77280, 646.4 g/L salt equivalent		x			x			
2000	Chruscielska et al.	*S. typhimurium* (4 strains)	Negative ± S9		Perzocyd 10 SL formulation			x			x		Chruscielska et al. 2000
2003a	Mecchi	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative		MON 78239 (36.6% glyphosate)		x			x		Increase in revertants seen in TA98 and TA1535 -S9 on first trial, not conc-dep; however no increase in revertants seen in repeat in those strains; overall neg.	
2003b	Mecchi	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative		MON 78634 (65.2% glyphosate)		x			x			
2004	Uhde	*S. typhimurium* (5 strains)	Negative ± S9		FSG 3090-HI (360 g/L G)	x	x			x			
2006	Xu	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative ± S9		MON 789 10 (30.3% glyphosate acid)		x			x		Cytotoxic ≥ 1000	

Year	Author	Test Type/System	Result	Glyphosate*	Formulated GBH*	Studies Cited in MON or Other Reviews	Regulatory	Public Literature	IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
2008	Lope	*S. typhimurium* (4 strains)	Negative ± S9		MON 79672 (Roundup Ultramax) 68.2% glyphosate	x	x			x			
2008a	Mecchi	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative		MON 79864 (38.7% glyphosate acid)		x			x			
2008b	Mecchi	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative		MON 76313 (30.9% glyphosate acid)		x			x			
2008c	Mecchi	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative		MON 76171 (31.1% glyphosate)	x	x			x			
2009	Camolesi	*S. typhimurium* (5 strains)	Negative ± S9		Glyphosate liquid formulation (480 g/L isopropylamine salt)	x	x			x			
2009	Catoyra	*S. typhimurium* (5 strains)	Negative ± S9		MON 76190 (53.2% glyphosate)	x	x			x			
2009a	Mecchi	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative		MON 79991 (71.6% glyphosate acid)		x			x			
2009b	Mecchi	*S. typhimurium* (4 strains), *Escherichia coli* (1 strain)	Negative		MON 76138 (38.5% glyphosate)	x	x			x			
2010	Camolesi	*S. typhimurium* (5 strains)	Negative ± S9		MON 77280 (495.29 g/La glyphosate acid)		x			x			
2010a	Flügge	*S. typhimurium* (5 strains)	Negative ± S9		TROP M (Glyphosate 480) (48.46% pure)	x	x			x			
2010d	Flügge	*S. typhimurium* (5 strains)	Negative ± S9		Glyphosate 757 g/kg granular (76.1 % monoammonium glyphosate salt)	x	x			x			
2011	Silvino	*S. typhimurium* (5 strains)	Negative ± S9		MON 8709 495 g/L glyphosate isopropylamine salt; 371.0 g/L (equivalent of glyphosate acid)		x			x			
2012	Silvino	*S. typhimurium* (5 strains)	Negative ± S9		MON 76313 495 g/L glyphosate isopropylamine salt; 371.0 g/L (equivalent of glyphosate acid)		x			x			

Summary Statistics: Formulated GBHs								
	Totals	**28**	**3**	**2**	**28**	**3**		
	Number Positive**	**0**	**1**	**1**	**0**	**1**		
	Percent Positive	**0%**	**33%**	**50%**	**0%**	**33%**		

Notes:

* When reported, the purity and chemical form of glyphosate technical or GBH formulations.

**All published studies are cited as indicated, full reference can be found in the paper bibliography. Regulatory studies are cited in EPA 2016 except where indicated.

** "Number of Positive" studies as reported by either EPA in the September 2016 review of glyphosate carcinogenicity, IARC Monographs 112 (2015), or in the Monsanto-commissioned reviews. In all cases, a study is reported as positive if one or more of the assays carried out resulted in a reported, positive response.

Table S2. *In Vitro* and *In Vivo* Mammalian Gene Mutation Assays Cited by EPA 2016 or IARC 2017

Studies on Glyphosate Technical

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1980	EPA	Mice- *in vivo*	Negative	Not reported in IARC 112.					x		x		EPA 1980
1983	Li [MRID 00132681]	Chines hamster ovary cells- *in vitro*	Negative	98.70%		x	x			x		Tested S9 from 1-10% Cytotoxic at 22.5 mg/mL (-S9, and with 1,2 and 10% S9) and at 17.5 mg/ml (10% S9)	
1985	Majeska [MRID 00155530]	Mouse lymphoma- *in vitro*	Negative	55.6% Glyphosate trimesium salt		x	x			x		Negative with pH adjusted	
1991	Jensen [MRID 49961504]	Mouse lymphoma- *in vitro*	Negative	98.60%		x	x			x			
1996	Clay	Mouse lymphoma- *in vitro*	Negative	95.60%		x	x			x		Relative survival was 90% (-S9) and 57% (+S9) at top concentration	
2000	Kaya et al.	Insects - *in vivo*	Positive	Not reported in IARC 112.					x		x		Kaya et al. 2000
Summary Statistics: Glyphosate Technical				**Totals**			**4**	**0**	**2**	**4**	**2**		
				Number Positive* **			**0**	**0**	**1**	**0**	**1**		
				Percent Positive			**0%**	**0%**	**50%**	**0%**	**50%**		

Studies on Formulated GBHs

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1995	Kale et al.	Sex-linked recessive lethal mutations (insect- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	Kale et al. 1995
Summary Statistics: Formulated GBHs				**Totals**			**0**	**0**	**1**	**0**	**1**		
				Number Positive**			**0**	**0**	**1**	**0**	**1**		
				Percent Positive			**0%**	**0%**	**100%**	**0%**	**100%**		

Notes:

* When reported, the purity and chemical form of glyphosate technical or GBH formulations.

**All published studies are cited as indicated, full reference can be found in the paper bibliography. Regulatory studies are cited in EPA 2016 except where indicated.

** "Number of Positive" studies as reported by either EPA in the September 2016 review of glyphosate carcinogenicity, IARC Monographs 112 (2015), or in the Monsanto-commissioned reviews. In all cases, a study is reported as positive if one or more of the assays carried out resulted in a reported, positive response.

Table S3. *In Vitro* Chromosomal Aberration Assays Cited by EPA 2016 or IARC 2017

Studies on Glyphosate Technical

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1985	Majeska [MRID 00155530]	Chinese hamster ovary cells	Negative	55.6% glyphosate trimesium salt			x			x		pH adjusted (7.4-7.6)	
1995	Matsumoto [MRID 50017106]	Chinese hamster lung cells	Negative	95.68%			x			x		Decline in pH noted at 500 and 1000 µg/mL.	
1996	Wright [MRID 49957410]	Chinese hamster lung cells	Negative	95.30%			x			x		Excessive decrease in pH >1250 µg/mL	
1998	Fox [MRID 49961803]	Human lymphocytes	Negative	95.60%			x			x		Excessive decrease in pH >1250 µg/mL	
1998	Lioi et al.	Bovine lymphocytes	Positive (all concs.)	≥98%				x			x		Lio et al. 1998a
1998	Lioi et al.	Human lymphocytes	Positive ≥ 8.5 µM	≥98%				x	x		x	No significant ↓ in MI observed.	Lio et al. 1998b
2006	Šiviková and Dianovský	Bovine lymphocytes	Negative	62.00%				x	x		x		Šiviková and Dianovský 2006
2009	Mañas et al.	Human lymphocytes	Positive	Not reported in IARC 112.				x	x		x	Dose-dependent	Mañas 2009a
2009	Mañas et al.	Human lymphocytes	Negative	96.00%					x		x	No toxicity observed up to 6000 µM	Mañas 2009b
Summary Statistics: Glyphosate Technical				**Totals**			**4**	**4**	**4**	**4**	**5**		
				Number Positive* **			**0**	**3**	**2**	**0**	**3**		
				Percent Positive			**0%**	**75%**	**50%**	**0%**	**60%**		

Studies on AMPA

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							EPA Regulatory	EPA Public Literature					
2009	Mañas et al.	Human lymphocytes	Positive		Not reported in IARC 112.				x		x	Human Lymphocytes	Mañas et al. 2009a
Summary Statistics: AMPA					**Totals**		**0**	**0**	**1**	**0**	**1**		
					Number Positive* **		**0**	**0**	**1**	**0**	**1**		
					Percent Positive		**0%**	**0%**	**100%**	**0%**	**100%**		

Studies on Formulated GBHs

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
2006	Holečková	Bovine lymphocytes	Negative		62% isopropylamine salt of glyphosate			x			x	Small but significant increase in polyploidy seen at 56µM. No positive control reported.	Holečková 2006
2012	Koller et al.	Human TR146 cells	Positive		Roundup Ultra Max (450 g/l glyphosate acid)			x	x		x	No apoptosis observed at any concentrations. Necrosis at 20 mg/L. Increase in NB, NPB, and MN at all concentrations.	Koller et al. 2012
Summary Statistics: Formulated GBHs					**Totals**		**0**	**2**	**1**	**0**	**2**		
					Number Positive **		**0**	**1**	**1**	**0**	**1**		
					Percent Positive		**0%**	**50%**	**100%**	**0%**	**50%**		

Notes:

* When reported, the purity and chemical form of glyphosate technical or GBH formulations.

**All published studies are cited as indicated, full reference can be found in the paper bibliography. Regulatory studies are cited in EPA 2016 except where indicated.

** "Number of Positive" studies as reported by either EPA in the September 2016 review of glyphosate carcinogenicity, IARC Monographs 112 (2015), or in the Monsanto-commissioned reviews. In all cases, a study is reported as positive if one or more of the assays carried out resulted in a reported, positive response.

Table S4. *In vitro* Micronuclei Induction in Mammalian Cells Assays Cited by EPA 2016 or IARC 2017

Studies on Glyphosate Technical

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							EPA	Public Literature					
2004	Piešová	Bovine lymphocytes	24 h: Negative 48 h: Equivocal	62%				x			x	No dose-response No significant decrease in CBPI observed.	Piešová 2004
2005	Piešová	Bovine lymphocytes	2 h: Negative 48 h: Equivocal	62%				x			x	No dose-response; No significant decrease in CBPI observed. Metabolic activation had no effect on MN formation after 2 h exposure.	Piešová 2005
2009	Mladinic et al.	Human lymphocytes	Negative -S9 Positive +S9	98%				x	x		x		Mladnic et al. 2009a
2009	Mladinic et al.	Human lymphocytes	Negative -S9 Positive +S9	98%				x			x		Mladnic et al. 2009b
2012	Koller et al.	Human TR146 cells	Positive Statistically significant	95%				x	x		x	Apoptosis and necrosis reported at 20 mg/L	Koller et al. 2012
2014	Roustan et al.	Human CHO-K1 cells	Negative -S9 Positive +S9 at 10-100 µg/mL	Not reported in EPA analysis				x	x		x	No clear dose response	Roustan et al. 2014
Summary Statistics: Glyphosate Technical				**Totals**			**0**	**6**	**3**	**0**	**6**		
				Number Positive* **			**0**	**4**	**3**	**0**	**4**		
				Percent Positive			**0%**	**67%**	**100%**	**0%**	**67%**		

Notes:

* When reported, the purity and chemical form of glyphosate technical or GBH formulations.

**All published studies are cited as indicated, full reference can be found in the paper bibliography. Regulatory studies are cited in EPA 2016 except where indicated.

** "Number of Positive" studies as reported by either EPA in the September 2016 review of glyphosate carcinogenicity, IARC Monographs 112 (2015), or in the Monsanto-commissioned reviews. In all cases, a study is reported as positive if one or more of the assays carried out resulted in a reported, positive response.

Table S5. *In vivo* Chromosomal Aberration Assays Cited by EPA 2016 or IARC 2017

Studies on Glyphosate Technical

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1980	Rodwell [MRID 00046364]	Rodent Dominant Lethal Test (mice- oral gavage)	Negative	98.70%			x			x			
1982	Majeska [MRID 00132176]	Bone Marrow Chromosomal Aberration Test (rats- oral gavage)	Negative	58.5% Glyphosate trimesium salt			x			x			
1983	Li [MRID 00132683]	Bone Marrow Chromosomal Aberration Test (rats, i.p.)	Negative	98%			x			x		No toxicity observed. A separate study using 14C-glyphosate showed that glyphosate reaches bone marrow 0.5 h after dosing with half-life elimination at 7.6 h. Peak BM value was 40 ppm, corresponding to 2000 ppm plasma value	
1992	Suresh [MRID 49987404]	Rodent Dominant Lethal Test (rats- oral gavage)	Negative	96.80%			x			x			
1994	Suresh [MRID 49987408]	Bone Marrow Chromosomal Aberration Test (mice- oral gavage)	Negative	96.80%			x			x		Significant ($p<0.05$) decrease in bw of females at high dose.	
2012	Siddiqui et al.	Chromosomal damage (plant system)	Positive	Not reported in IARC 112.					x		x		Siddiqui et al. 2012
2012	Frescura et al.	Chromosomal damage (plant system)	Positive	Not reported in IARC 112.					x		x	Single dose only	Frescura et al. 2013
Summary Statistics: Glyphosate Technical				**Totals**			**5**	**0**	**2**	**5**	**2**		
				Number Positive* **			**0**	**0**	**2**	**0**	**2**		
				Percent Positive			**0%**	**0%**	**100%**	**0%**	**100%**		

Studies on Formulated GBHs

Year	Author	Test Type/ System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1993	Rank et al.	Chromosomal damage (plant system)	Positive		Not reported in IARC 112.				x		x		Rank et al. 1993
2005	Helal and Moussa	Bone Marrow Chromosomal Aberration Test (rabbits- drinking water)	Positive		Roundup			x			x		Helal and Moussa 2005
2006	Amer et al.	Bone Marrow Chromosomal Aberration Test (mice- i.p.)	Positive		84% glyphosate						x		Amer et al. 2006
2006	Amer et al.	Bone Marrow Chromosomal Aberration Test (mice- oral admin)	Positive		84% glyphosate						x		Amer et al. 2006
2006	Dimitrov et al.	Bone Marrow Chromosomal Aberration Test (mice- oral admin)	Negative		Roundup			x	x		x		Dimitrov et al. 2006
2008	Cavalcante et al.	Chromosomal damage (fish assay)	Negative		Not reported in IARC 112.				x		x		Cavalcante et al. 2008
2009	Prasad et al.	Bone Marrow Chromosomal Aberration Test (mice- i.p.)	Positive Increase in MN at all time points/doses		Roundup (>41% isopropylamine glyphosate)			x	x		x	Significant decrease in mitotic index seen at all doses/time points	Prasad et al. 2009
2011	Truta et al.	Chromosomal damage (plant system)	Positive		Not reported in IARC 112.				x		x		Truta et al. 2011
Summary Statistics: Formulated GBHs				**Totals**			**0**	**3**	**5**	**0**	**8**		
				Number Positive**			**0**	**2**	**3**	**0**	**6**		
				Percent Positive			**0%**	**67%**	**60%**	**0%**	**75%**		

Notes:

* When reported, the purity and chemical form of glyphosate technical or GBH formulations.

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** "Number of Positive" studies as reported by either EPA in the September 2016 review of glyphosate carcinogenicity, IARC Monographs 112 (2015), or in the Monsanto-commissioned reviews. In all cases, a study is reported as positive if one or more of the assays carried out resulted in a reported, positive response.

Table S6. *In Vivo* Micronuclei Induction in Cells Assays Cited by EPA 2016 or IARC 2017

Studies on Glyphosate Technical

Year	Author	Test Type/System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1987	Majeska [MRID 40214004]	Mice (males and females) - oral gavage	Negative	53.3% glyphosate trimesium salt			x			x			
1991	Jensen [MRID 49961503]	Mice (males and females) - oral gavage	Negative	98.60%			x			x			
1992	De Marco et al.	*Vicia faba* (bean)	Negative	Not reported in IARC 112.					x		x	Non-mammalian (plant system)	DeMarco et al. 1992
1992	Chan and Mahler	Mice (males and females) - dietary	Negative	99%				x	x		x		Chan and Mahler 1992
1993	Rank et al.	Mice - i.p.	Negative	Not reported in EPA analysis				x	x		x		Rank et al. 1993
1993	Suresh [MRID 49987407]	Mice (males and females) - oral gavage	Positive in females at higher dose. Negative in males	96.8% glyphosate acid			x			x			
1996	Zaccaria [MRID 49961501]	Mice (males and females) - i.p.	Negative	360 g/L			x			x		Doses selected were reported as corresponding to 25, 50 and 75% LD50	
1996	Fox and Mackay [MRID 44320619]	Mice (males and females) - oral gavage	Negative	95.60%			x			x			
1997	Bolognesi et al.	Mice (males only)- i.p.	Positive	99.90%				x	x		x		Bolognesi et al. 1997
1999	Jones	Mice (males only) - oral gavage	Negative	59.3% potassium glyphosate salt			x			x			
1999	Marques [MRID 49957412]	Mice (males and females) - i.p.	Negative	954.9 g/kg (Nufarm)			x			x		LD50 was 750 mg/kg	
2000	Chruscielska et al.	Mice (males only) - i.p.	Negative	Not reported in EPA analysis				x			x		Chruscielska et al. 2000
2000	Gava	Mice (males and females) - i.p.	Negative	612.7 g/kg (Nufarm)			x			x		LD50 was 4032 mg/kg	
2005	Honarvar	Mice (males and females) - oral gavage	Negative	97.73%			x			x			
2006	Durward [MRID 49957411]	Mice (males only) - i.p.	Negative	95.70%			x			x		Clinical signs reported at ≥ 150 mg/kg. Significant ↓ in %PCEs reported at 24 h in 600 mg/kg group. ↑in MN PCEs observed at 600 mg/kg (1.9± 0.7 vs. 1.0 ± 1.2 control; p<0.05), at 24 h, but not 48 h, within historical control range.	
2007	Zoriki Hosomi [MRID 50000901]	Mice (males only) - oral gavage	Negative	980.1 g/kg			x			x			
2008	Costa	Mice (males and females) - i.p.	Negative	980 g/kg			x			x			
2008	Honarvar [MRID 49961802]	Mice (males only) - oral gavage	Negative	99.10%			x			x			
2009	Flügge	Rats (males and females) - oral gavage	Negative	98.80%			x			x			
2009	Mañas et al.	Mice (males and females) - i.p.	Positive	96%					x		x		Mañas et al. 2009a

Summary Statistics: Glyphosate Technical								
	Totals	**14**	**4**	**5**	**14**	**6**		
	Number Positive* **	**1**	**1**	**2**	**1**	**2**		
	Percent Positive	**7%**	**25%**	**40%**	**7%**	**33%**		

Studies on AMPA

Year	Author	Test Type/System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							EPA Regulatory	EPA Public Literature					
2009	Mañas et al.	Mice - i.p.	Positive		Not reported in IARC 112.				x		x	Mouse Bone marrow	Mañas et al. 2009a

Summary Statistics: AMPA						
Totals	**0**	**0**	**1**	**0**	**1**	
Number Positive* **	**0**	**0**	**1**	**0**	**1**	
Percent Positive	**0%**	**0%**	**100%**	**0%**	**100%**	

Studies on Formulated GBHs

Year	Author	Test Type/System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1992	Kier	Mice (males and females) - i.p.	Negative		Roundup (31% glyphosate salt)		x			x		Some deaths observed at high dose (HD), ↓PCE/NCE ratio at HD at 48 h in males.	
1993	Rank et al.	Mice - i.p.	Negative		Roundup (480 g glyphosate isopropylamine salt/L)			x	x		x	BM toxicity indicated by %PCE decreased at 200 mg/kg	Rank et al. 1993

Year	Author	Test Type/System	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1997	Bolognesi et al.	Mice (males only) - i.p.	Positive		Roundup (30.4% glyphosate)			x	x		x	Stat significant increase in MN at 6 and 24 h	Bolognesi et al. 1997
1998	Monma	Mice (males and females) - i.p.	Negative		MON 77280 (646.4 g/L glyphosate salt equivalent)		x			x		Doses tested corresponded to 25%, 50% and 75% LD50	
2000	Chruscielska et al.	Mice (males only) - i.p.	Negative		Not reported in EPA analysis			x			x		Chruscielska et al. 2000
2002	Grisolia	Mice (males and females) - i.p.	Negative		Roundup, 480 g/L isopropylamine salt of glyphosate			x	x		x	Plant system	Grisolia 2002
2003a	Erexson	Mice (males only) - oral gavage	Negative		MON 78239 (36.6% glyphosate)		x			x			
2003b	Erexson	Mice (males only) - oral gavage	Negative		MON 78634 (62.2%a. glyphosate)		x			x			
2006	Dimitrov et al.	Mice (males only) - oral	Negative		Roundup			x	x		x	Toxicity seen in 1.0% dose group	Dimitrov et al. 2006
2006	Erexson	Mice (males only) - oral gavage	Negative		MON 78910 (30.3% glyphosate)		x			x			
2007	Cavas and Könen	Goldfish, erythrocytes	Positive		Not reported in IARC 112.				x		x	Fish assay	Cavas and Könen 2007
2008	Cavalcante et al.	Sábalo fish, erthrocytes	Negative		Not reported in IARC 112.				x		x	Fish, single dose only	Cavalcante et al. 2008
2008a	Xu	Mice (males only) - oral gavage	Negative		MON 79864 (38.7% glyphosate)		x			x			
2008b	Xu	Mice (males only) - oral gavage	Negative		MON 76171 (31.1% glyphosate)		x			x			
2009	Negro Silva	Mice (males only) - oral gavage	Negative		AI7035A (280.7 g/L glyphosate)	x	x			x			
2009	Poletta et al.	Caiman - in-ovo exposure	Positive		Not reported in IARC 112.				x		x	Caiman, in-ovo exposure	Poletta et al. 2009
2009a	Xu	Mice (males only) - oral gavage	Negative		MON 79991 (71.6% glyphosate)		x			x			
2009b	Xu	Mice (males only) - oral gavage	Negative		MON 76138 (38.5% glyphosate)	x	x			x			
2009c	Xu	Mice (males only) - oral gavage	Negative		MON 76313 (30.9% glyphosate)	x	x			x			
2010c	Flügge	Mice (males and females) - oral gavage	Negative		TROP M (Glyphosate 480: 358.4 g/L glyphosate acid, 483.6 g/L IPA salt)	x	x			x			
2010e	Flügge	Rats (males and females) - oral gavage	Negative		757 g/kg granular formulation (69. 1% glyphosate acid)	x	x			x			
2011	Claro	Mice (males only) - oral gavage	Negative		MON 87094 (94.7 g/L salt of isopropylamine)		x			x			
2011	Negro Silva	Mice (males only) - oral gavage	Negative		Glyphosate SL (499.35 g/L glyphosate)	x	x			x			
2011	Poletta et al.	Caiman - in-ovo exposure	Positive		Not reported in IARC 112.				x		x	Caiman, single dose only	Poletta et al. 2011
2013	de Castilhos Ghisi and Cestari	Fish (three species), blood and hepatic cells	Negative		Not reported in IARC 112.				x		x	Fish, single dose only	de Castilhos Ghisi and Cestari 2013
2013	De Souza Filho et al.	Guppy, gill erythrocytes	Positive		Not reported in IARC 112.				x		x	Fish assay	De Souza Filho et al. 2013
2013	Vera-Candioti et al.	*Cnesterodon* fish, blood erythrocytes	Positive		Not reported in IARC 112.				x		x	Fish, positive at both doses	Vera-Candioti et al. 2013
2013	Yadav et al.	Frog, erythrocytes	Positive		Not reported in IARC 112.				x		x	Frog	Yadav et al. 2013
Summary Statistics: Formulated GBHs					**Totals**		**15**	**5**	**12**	**15**	**13**		
					Number Positive**		**0**	**1**	**7**	**0**	**7**		
					Percent Positive		**0%**	**20%**	**58%**	**0%**	**54%**		

Notes:

* When reported, the purity and chemical form of glyphosate technical or GBH formulations.

**All published studies are cited as indicated, full reference can be found in the paper bibliography. Regulatory studies are cited in EPA 2016 except where indicated.

** "Number of Positive" studies as reported by either EPA in the September 2016 review of glyphosate carcinogenicity, IARC Monographs 112 (2015), or in the Monsanto-commissioned reviews. In all cases, a study is reported as positive if one or more of the assays carried out resulted in a reported, positive response.

Table S7. Assays for Detecting Primary DNA Damage Assays Cited by EPA 2016 or IARC 2017

Studies on Glyphosate Technical

Year	Author	Test Type	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
1978	Shirasu [MRID 0078619]	DNA Repair Test (*in vitro*)	Negative	98.40%			x			x			
1982	Majeska [MRID 00126616]	Cell Transformation Assay (BALB/3T- cells *in vitro*)	Negative	90% glyphosate trimesium salt			x			x			
1988	Li and Long	Unscheduled DNA synthesis (rat primary hepatocytes- *in vitro*)	Negative	98.00%				x	x		x		Li and Long 1988
1997	Bolognesi et al.	Alkaline elution assay (mice- i.p.)	Positive (Increased elution rate) at 4 hrs in liver/kidney, At 24 hrs returned to control levels	99.90%				x	x		x		Bolognesi et al. 1997
1997	Bolognesi et al.	DNA oxidative damage: 8-OHdG formation (mice- i.p.)	Negative: Kidney Positive: Liver	99.90%				x	x		x		Bolognesi et al. 1997
1997	Bolognesi et al.	Sister chromatide exchange (SCE) (Human lymphocytes- *in vitro*)	Positive	99.90%				x	x		x	Return to control values may indicate DNA repair or reflect rapid elimination of compound	Bolognesi et al. 1997
1998	Lioi	Sister chromatide exchange (SCE) (human lymphocytes- *in vitro*)	Positive Significant (p>0.05) increase in SCE/cell at ≥8.5 µM	≥98%				x			x	1.9-, 2.8-, and 2.6-fold increase at 8.5, 17 and 51 µM, respectively	Lio 1998a
1998	Lioi	Sister chromatide exchange (SCE) (bovine lymphocytes- *in vitro*)	Positive Significant (p>0.05) increase in SC/cell at all concentrations	≥98%				x	x		x	1.8-, 2.1-, 1.6-fold increases, respectively	Lio 1998b
1998	Peluso et al..	DNA adducts 32P-postlabeling (mice- i.p.)	Negative	Not reported in EPA analysis.				x	x		x		Peluso et al. 1998
2004	Lueken et al.	DNA damage- DNA strand breaks, COMET assay (Acellular systems- *in vitro*)	Negative	Not reported in IARC 112.					x		x		Lueken et al. 2004
2004	Lueken et al.	DNA damage- DNA strand breaks, COMET assay (human lymphocytes- *in vitro*)	Positive	Not reported in IARC 112.					x		x		Lueken et al. 2004
2005	Monroy et al..	DNA damage, DNA strand breaks- Comet (Human GM38 normal cells- *in vitro*)	Positive	Not reported in abstract.					x		x		Monroy et al. 2005
2005	Monroy et al..	DNA damage, DNA strand breaks- Comet (Human HT1080 fibrosarcoma cells- *in vitro*)	Positive	Not reported in abstract.					x		x		Monroy et al. 2005
2006	Šiviková and Dianovský	Sister chromatide exchange (SCE) (bovine lymphocytes- *in vitro*)	Positive (-S9). Equivocal (+S9) (bovine lymphocytes)	62%				x	x		x	The increases in SCEs observed did not show a clear concentration related increase across a 40-fold increase in the concentrations tested	Šiviková and Dianovský 2006
2009	Mañas et al.	Single-cell gel electrophoresis (SCGE) assays-Comet assay (Hep-2 cells)	Positive Significant increase in mean tail length/ tail intensity at all concentrations. *In vitro*	96%				x	x		x		Mañas et al. 2009
2009	Mladinic et al.	Single-cell gel electrophoresis (SCGE) assays-Comet assay (human lymphocytes- *in vitro*)	Positive ±S9	98%				x	x		x		Mladnic et al. 2009a
2009	Mladinic et al.	DNA damage, DNA strand breaks- COMET (human lymphocytes- *in vitro*)	Positive	Not reported in IARC 112.					x		x	Dose-dependent	Mladinic et al. 2009b
2011	Alvarez-Moya et al.	DNA damage, DNA strand breaks- COMET (Fish assay- *in vivo*)	Positive	Not reported in IARC 112					x		x		Alvarez-Moya et al. 2011
2011	Alvarez-Moya et al.	DNA damage, DNA strand breaks- COMET (Plant assay- *in vivo*)	Positive	Not reported in IARC 112					x		x		Alvarez-Moya et al. 2011
2012	Akcha et al.	DNA damage, DNA strand breaks- COMET (oyster assay- *in vivo*)	Negative	Not reported in IARC 112					x		x		Akcha et al. 2012
2012	Chen et al.	DNA damage, DNA strand breaks- COMET (bacteria- *in vitro*)	Positive	Not reported in IARC 112					x		x	Single dose only	Chen et al. 2012
2012	Guilherme et al.	DNA damage, DNA strand breaks- COMET (Fish assay- *in vivo*)	Positive	Not reported in IARC 112					x		x		Guilherme et al. 2012b
2012	Koller et al.	Single-cell gel electrophoresis (SCGE) assays-COMET assay (human epithelial cells- *in vitro*)	Positive Increased DNA migration at >20 mg/L	95%				x	x		x	Also measured multiple cellular integrity parameters to assess cytotoxicity. No clear evidence of cytotoxicity seen except for increase in enzyme activity (indicative of membrane damage) in LDHe (extracellular lactate dehydrogenase) assay at >80 mg/L.	Koller et al. 2012

Year	Author	Test Type	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
2012	Wang et al.	DNA damage, DNA strand breaks- COMET (bacteria- *in vitro*)	Positive	Not reported in IARC 112					x		x	Single dose only	Wang et al. 2012
2013	Mañas et al.	Single-cell gel electrophoresis (SCGE) assays-Comet assay with oxidative stress measures (mice- drinking water)	Positive Blood and liver at both doses	96%				x			x	Only minor effects seen on oxidative stress measurements	Mañas et al. 2013
2014	Alvarez-Moya et al.	DNA damage, DNA strand breaks- acridine orange method (Fish assay- *in vitro*)	Positive	Not reported in IARC 112					x		x		Alvarez-Moya et al. 2014
2014	Alvarez-Moya et al.	Single-cell gel electrophoresis (SCGE) assays-Comet assay (human lymphocytes- *in vitro*)	Positive at all doses (increase in tail length only).	96.00%				x	x		x	Dose-dependent response	Alvarez-Moya et al. 2014
2014	Lopes et al.	DNA damage, DNA strand breaks- acridine orange method (Fish assay- *in vivo*)	Positive	Not reported in IARC 112					x		x		Lopes et al. 2014
2014	Moreno et al.	DNA damage, DNA strand breaks- COMET (Fish assay- *in vivo*)	Positive	Not reported in IARC 112					x		x		Moreno et al. 2014
Summary Statistics: Glyphosate Technical				**Totals**			**2**	**13**	**25**	**2**	**27**		
				Number Positive* **			**0**	**11**	**21**	**0**	**23**		
				Percent Positive			**0%**	**85%**	**84%**	**0%**	**85%**		
Studies on AMPA													
Year	**Author**	**Test Type**	**Result**	**Glyphosate***	**Formulated GBH***	**Industry Studies Cited in MON or Other Reviews**	**EPA 2016**		**IARC 2017**	**All Regulatory**	**All Public Literature**	**Comments**	**Citation****
							EPA Regulatory	**EPA Public Literature**					
2009	Mañas et al.	DNA damage- DNA strand breaks - COMET (Human Liver Hep-2 cells- *in vitro*)	Positive		Not reported in IARC 112.				x		x		Mañas et al. 2009
2014	Guilherme et al.	Chromosomal damage, other (ENA) (Fish assay- *in vivo*)	Positive		Not reported in IARC 112				x		x	Highest dose only	Guilherme et al. 2014b
2014	Guilherme et al.	DNA damage, DNA strand breaks- COMET (Fish assay- *in vivo*)	Positive		Not reported in IARC 112				x		x		Guilherme et al. 2014b
Summary Statistics: AMPA				**Totals**			**0**	**0**	**3**	**0**	**3**		
				Number Positive* **			**0**	**0**	**3**	**0**	**3**		
				Percent Positive			**0%**	**0%**	**100%**	**0%**	**100%**		
Studies on Formulated GBHs													
Year	**Author**	**Test Type**	**Result**	**Glyphosate***	**Formulated GBH***	**Industry Studies Cited in MON or Other Reviews**	**EPA 2016**		**IARC 2017**	**All Regulatory**	**All Public Literature**	**Comments**	**Citation****
							Regulatory	**Public Literature**					
1980	Vigfusson and Vyse	Sister Chromatid Exchange (human lymphocytes- *in vitro*)	Positive Stat. significant increase ($p<0.001$) at 250 µg/mL in both donors, and in one donor at 2500 µg/mL		Roundup (isopropylamine salt of glyphosate)			x	x		x	No growth seen at highest concentration (25 mg/mL)	Vigfusson and Vyse 1980
1997	Bolognesi et al.	Alkaline elution assay DNA Single strand DNA break (mice- i.p.)	Positive 4 h: liver/kidney 24h: returned to control levels		Roundup Ultra Max (270 mg/kg glyphosate)			x	x		x	Return to control values at 24 h may indicate DNA repair or reflect rapid elimination of compound	Bolognesi et al. 1997
1997	Bolognesi et al.	DNA oxidative damage: 8-OHdG formation (mice- i.p.)	Positive: Kidney at 8 and 24 h Negative: liver		270 mg/kg glyphosate			x	x		x		Bolognesi et al. 1997
1997	Bolognesi et al.	Sister Chromatid Exchange (human lymphocytes- *in vitro*)	Positive		Roundup (30.4% glyphosate)			x	x		x	Stat significant increase in SCE/cell at ≥ 0.1 mg/mL	Bolognesi et al. 1997
1997	Clements et al.	DNA damage, DNA strand breaks (frog tadpole- *in vivo*)	Positive		Not reported in IARC 112				x		x		Clements et al. 1997
1998	Peluso et al.	DNA adducts 32P-postlabeling (mice- i.p.)	Positive (liver and kidney)		Roundup (30.4% isopropylamine salt of glyphosate)			x	x		x		Peluso et al.. 1998
2004	Conners and Black	DNA damage, DNA strand breaks (mussel larvae- *in vivo*)	Negative		Not reported in IARC 112				x		x		Conners and Black 2004
2006	Amer et al.	Sister Chromatid Exchange (mice spleen cells- *in vitro*)	Positive		84% glyphosate						x		Amer et al. 2006
2006	Šiviková and Dianovský	Sister Chromatid Exchange (bovine lymphocytes- *in vitro*)	Positive		62% isopropylamine salt of glyphosate			x	x		x		Šiviková and Dianovský 2006
2007	Cavas and Könen	DNA damage, DNA strand breaks (fish- *in vivo*)	Positive		Not reported in IARC 112				x		x		Cavas and Könen 2007
2007	Paz-y-Miño et al.	Human exposure *in vivo* - DNA damage, DNA strand breaks, COMET assay	Positive		Not reported in IARC 112				x		x	24 people exposed during aerial spraying in Ecuador; 21 non-exposed controls	Paz-y-Miño et al. 2007
2008	Cavalcante et al.	DNA damage, DNA strand breaks (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	Cavalcante et al. 2008
2009	Bolognesi et al. 2009	Human exposure *in vivo* - Chromosomal damage, Chromosomal aberrations	Positive		Not reported in IARC 112				x		x	Studied people two years after exposure via aerial spraying, as reported in Paz-y-Miño et al. 2007	Bolognesi et al. 2009
2009	Bolognesi et al. 2009	Human exposure *in vivo* - Chromosomal damage, Micronucleus formation	Positive		Not reported in IARC 112				x		x	55 community residents in Columbia, exposed following aerial spraying	Bolognesi et al. 2009
2009	Bolognesi et al. 2009	Human exposure *in vivo* - Chromosomal damage, Micronucleus formation	Positive		Not reported in IARC 112				x		x	Studied impacts before spraying and after spraying in same individuals	Bolognesi et al. 2009
2009	Poletta et al.	DNA damage, DNA strand breaks- COMET (Caiman, in-ovo exposure- *in vivo*)	Positive		Not reported in IARC 112.				x		x		Poletta et al. 2008
2009	Gasnier et al.	DNA strand breaks - COMET (Human liver Hep 2 cells- *in vitro)*	Positive		Not reported in IARC 112				x		x	Dose-dependent	Gasnier et al. 2009
2009	Raipulis et al.	Bacterial SOS Chromotest	Positive		Roundup BIO formulation			x			x		Raipulis et al. 2009
2010	Guilherme et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112				x		x	Dose-dependent	Guilherme et al. 2010
2010	Guilherme et al.	Chromosomal damage, Other -ENA (fish- *in vivo*)	Positive		Not reported in IARC 112				x		x		Guilherme et al. 2010
2011	Mohamed	DNA damage, DNA strand breaks- COMET (snail- *in vivo*)	Positive		Not reported in IARC 112				x		x	Single dose only	Mohamed 2011
2011	Paz-y-Miño et al. 2011	Human exposure *in vivo* - Chromosomal damage, Chromosomal aberrations	Negative		Not reported in IARC 112				x		x	2 years after spraying, tested same individuals as 2007 study	Paz-y-Miño et al. 2011
2011	Poletta et al.	DNA damage, DNA strand breaks- COMET (caiman - *in vivo*)	Negative		Not reported in IARC 112.				x		x	Single dose only	Poletta et al. 2011
2012	Akcha et al.	DNA damage, DNA strand breaks- COMET (oyster - *in vivo*)	Negative		Not reported in IARC 112.				x		x	Single dose only	Akcha et al. 2012
2012	Guilherme et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112				x		x	Single dose only	Guilherme et al. 2012b
2012	Koller et al.	Single-cell gel electrophoresis (SCGE) assays-Comet assay (human epithelial cells- *in vitro*)	Positive Increase DNA migration at >20 mg/L		Roundup Ultra Max (450 g/l glyphosate acid)			x	x		x	Also measured multiple cellular integrity parameters to assess cytotoxicity. Formulation was more toxic than technical. Significant increase in LDHe at all concentrations tested. Cytotoxic ≥ 60 mg/L	Koller et al. 2012

Year	Author	Test Type	Result	Glyphosate*	Formulated GBH*	Industry Studies Cited in MON or Other Reviews	EPA 2016		IARC 2017	All Regulatory	All Public Literature	Comments	Citation**
							Regulatory	Public Literature					
2013	de Castilhos Ghisi and Cestari	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	de Castilhos Ghisi and Cestari 2013
2013	De Souza Filho et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x		De Souza Filho et al. 2013
2013	Gholami-Seyedkolaei et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	Gholami-Seyedkolaei et al. 2013
2013	Meza-Joya et al.	DNA damage, DNA strand breaks- COMET (frog- *in vivo*)	Positive		Not reported in IARC 112.				x		x		Meza-Joya et al. 2013
2013	Nwani et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x		Nwani et al. 2013
2013	Piola et al.	DNA damage, DNA strand breaks- COMET (worm- *in vivo*)	Positive		Not reported in IARC 112.				x		x		Piola et al. 2013
2014	Guilherme et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	Guilherme et al. 2014a
2014	Marques et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	Marques et al. 2014
2014	Moreno et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	Moreno et al. 2014
2014	dos Santos and Martinez	DNA damage, DNA strand breaks- COMET (clam- *in vivo*)	Negative		Not reported in IARC 112.				x		x		dos Santos and Martinez 2014
2014	Muangphra et al.	DNA damage, DNA strand breaks- COMET (worm- *in vivo*)	Positive		Not reported in IARC 112.				x		x		Muangphra et al. 2014
2015	Marques et al.	DNA damage, DNA strand breaks- COMET (fish- *in vivo*)	Positive		Not reported in IARC 112.				x		x	Single dose only	Marques et al. 2015
Summary Statistics: Formulated GBHs				**Totals**			**0**	**8**	**36**	**0**	**38**		
				Number Positive**			**0**	**8**	**31**	**0**	**33**		
				Percent Positive			**0%**	**100%**	**86%**	**0%**	**87%**		

Notes:

* When reported, the purity and chemical form of glyphosate technical or GBH formulations.

**All published studies are cited as indicated, full reference can be found in the paper bibliography. Regulatory studies are cited in EPA 2016.

** "Number of Positive" studies as reported by either EPA in the September 2016 review of glyphosate carcinogenicity, IARC Monographs 112 (2015), or in the Monsanto-commissioned reviews. In all cases, a study is reported as positive if one or more of the assays carried out resulted in a reported, positive response.

Table S8. Glyphosate, AMPA, and GBH Genotoxicity Assays Included by IARC Working Group in the Assay Tables of the 2017 Glyphosate Monograph (see notes)						
Citation	**End-point Studied**	**Test/ Assay**	**Response/ Results**	**Comments**	**Cited by --**	
					MON Reviews	**EPA Sept. 2016**
Exposed Humans						
Paz-y-Miño et al. 2007	DNA damage	DNA strand breaks, COMET assay	Positive	24 people exposed during aerial spraying in Ecuador; 21 non-exposed controls	x	
Bolognesi et al. 2009	Chromosomal damage	Micronucleus formation	Positive	55 community residents in Nariño, Columbia, exposed following aerial spraying	x	
Bolognesi et al. 2009	Chromosomal damage	Micronucleus formation	Positive	53 community residents in Putumayo, Columbia, exposed following aerial spraying	x	
Bolognesi et al. 2009	Chromosomal damage	Micronucleus formation	Positive	27 community residents in Valle del Cauca, Columbia, exposed following aerial spraying	x	
Paz-y-Miño et al. 2011	Chromosomal damage	Chromosomal aberrations	Negative	2 years after spraying, tested same individuals as 2007 study	x	
				Total Cited By MON and EPA	**5**	**0**
				Total Number of Assays	**5**	
				Number Positive	**4**	
				Percent Positive	**80%**	
Human Cells *In Vitro* -- Glyphosate						
Bolognesi et al. 1997	Chromosomal damage	Sister-chromatid exchange	Positive	Lymphocytes	x	x
Lueken et al. 2004	DNA damage	DNA strand breaks, COMET assay	(Positive)*	Fibroblast GM 5757 assay		
Monroy et al. 2005	DNA damage	DNA strand breaks, COMET assay	Positive	Fibrosarcoma HT1080 assay	x	
Monroy et al. 2005	DNA damage	DNA strand breaks, COMET assay	Positive	Fibroblast GM 38 assay	x	
Mañas et al. 2009a	DNA damage	DNA strand breaks, COMET	Positive	Liver Hep-2, dose-dependent	x	x
Mañas et al. 2009a	Chromosomal damage	Chromosomal aberrations	Positive	Lymphocytes	x	x
Mladinic et al. 2009a	Chromosomal damage	Chromosomal aberrations	Negative	Lymphocytes	x	x
Mladinic et al. 2009b	DNA damage	DNA strand breaks, COMET assay	Positive	Lymphocytes, dose-response relationship	x	x
Koller et al. 2012	DNA damage	DNA strand breaks, COMET assay	Positive	Buccal carcinoma TR146, dose-dependent	x	x
Alvarez-Moya et al. 2014	DNA damage	DNA strand breaks	Positive	Lymphocytes		x
				Total Cited By MON and EPA	**8**	**7**
				Total Number of Assays	**10**	
				Number Positive	**9**	
				Percent Positive	**90%**	
Human Cells *In Vitro* -- AMPA						
Mañas et al. 2009a	Chromosomal damage	Chromosomal aberrations	Positive	Lymphocytes	x	
Mañas et al. 2009a	DNA damage	DNA strand breaks, COMET	Positive	Liver Hep-2, dose-dependent	x	
				Total Cited By MON and EPA	**2**	**0**
				Total Number of Assays	**2**	
				Number Positive	**2**	
				Percent Positive	**100%**	
Human Cells *In vitro* -- Formulated GBHs						
Vigfusson and Vyse 1980	DNA damage	Sister chromatid exchange	Positive	Lymphocytes		x
Bolognesi et al. 1997	Chromosomal damage	Sister-chromatid exchange	Positive	Lymphocytes	x	x
Gasnier et al. 2009	DNA damage liver Hep 2 cells	DNA strand breaks, COMET	(Positive)*	Liver Hep, dose-dependent increase		
Koller at al 2012	DNA damage	DNA strand breaks, SCGE assay	Positive	Buccal carcinoma, dose-dependent increase	x	x
				Total Cited By MON and EPA	**2**	**3**
				Total Number of Assays	**4**	
				Number Positive	**4**	
				Percent Positive	**100%**	

Citation	End-point Studied	Test/ Assay	Response/ Results	Comments	Cited by --	
					MON Reviews	EPA Sept. 2016
Non-Human Mammals *In Vivo* -- Glyphosate						
EPA 1980	Mutation	Dominant lethal test	Negative	Mouse		
Li and Long 1988	Chromosomal damage	Chromosomal aberrations	Negative	Rat	x	x
Rank et al. 1993	Chromosomal damage	Micronucleus formation	Negative	Mouse	x	x
Bolognesi et al. 1997	Chromosomal damage	Micronucleus formation	Positive	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- kidney	DNA adducts	Negative	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- kidney	DNA breaks	Positive	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- liver	DNA adducts	Positive	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- liver	DNA breaks	Positive	Mouse, single dose only	x	x
Peluso et al. 1998	DNA damage -- kidney	DNA adducts	Negative	Mouse	x	x
Peluso et al. 1998	DNA damage -- liver	DNA adducts	Negative	Mouse	x	x
Mañas et al. 2009a	Chromosomal damage	Micronucleus formation	Positive	Mouse, single dose only	x	x
				Total Cited By MON and EPA	**10**	**10**
				Total Number of Assays	**11**	
				Number Positive	**5**	
				Percent Positive	**45%**	
Non-Human Mammals *In Vivo* -- AMPA						
Mañas et al. 2009b	Chromosomal damage	Micronucleus formation	Positive	Mouse bone marrow	x	
				Total Cited By MON and EPA	**1**	**0**
				Total Number of Assays	**1**	
				Number Positive	**1**	
				Percent Positive	**100%**	
Non-Human Mammals *In Vivo* -- Formulated GBHs						
Rank et al. 1993	Chromosomal damage	Micronucleus formation	Negative	Mouse	x	x
Bolognesi et al. 1997	Chromosomal damage	Micronucleus formation	Positive	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- kidney	DNA adducts	Positive	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- kidney	DNA strand breaks	Positive	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- liver	DNA strand breaks	Positive	Mouse, single dose only	x	x
Bolognesi et al. 1997	DNA damage -- liver	DNA adducts	Negative	Mouse, single dose only	x	x
Peluso et al. 1998	DNA damage -- kidney	DNA adducts	Positive	Mouse	x	x
Peluso et al. 1998	DNA damage -- liver	DNA adducts	Positive	Mouse	x	x
Grisolia 2002	Chromosomal damage	Micronucleus formation	Negative	Mouse	x	x
Dimitrov et al. 2006	Chromosomal damage	Chromosomal aberrations	Negative	Mouse, single dose only	x	x
Dimitrov et al. 2006	Chromosomal damage	Micronucleus formation	Negative	Mouse, single dose only	x	x
Prasad et al. 2009	Chromosomal damage	Chromosomal aberrations	Positive	Mouse, dose dependent	x	x
Prasad et al. 2009	Chromosomal damage	Micronucleus formation	Positive	Mouse, both doses, all times	x	x
				Total Cited By MON and EPA	**13**	**13**
				Total Number of Assays	**13**	
				Number Positive	**8**	
				Percent Positive	**62%**	
Non-Human Mammalian Cells *In Vitro* -- Glyphosate						
Li and Long 1988	DNA damage	Unscheduled DNA synthesis	Negative	Rat Hepatocytes	x	x
Li and Long 1988	Mutation	Hprt mutation	Negative	Chinese hamster ovary cells	x	x
Lioi et al. 1998	Chromosomal damage	Chromosomal aberrations	Positive	Bovine lymphocytes	x	x
Lioi et al. 1998	Chromosomal damage	Sister chromatid exchange	Positive	Bovine lymphocytes	x	x
Roustan et al. 2014	Chromosomal damage	Micronucleus formation	Positive	Chinese hamster ovary cells	x	x
				Total Cited By MON and EPA	**5**	**5**
				Total Number of Assays	**5**	
				Number Positive	**3**	
				Percent Positive	**60%**	
Non-Human Mammalian Cells *In Vitro* -- AMPA						
Roustan et al. 2014	Chromosomal damage	Micronucleus formation	Positive	Chinese hamster ovary cells	x	
				Total Cited By MON and EPA	**1**	**0**
				Total Number of Assays	**1**	
				Number Positive	**1**	
				Percent Positive	**100%**	

Citation	End-point Studied	Test/ Assay	Response/ Results	Comments	Cited by --	
					MON Reviews	EPA Sept. 2016
Non-Human Mammalian Cells *In Vitro* -- Formulated GBHs						
Šiviková and Dianovský 2006	Chromosomal damage	Chromosomal aberrations	Negative	Bovine lymphocytes	x	x
Šiviková and Dianovský 2006	Chromosomal damage	Sister chromatid exchange	Positive	Bovine lymphocytes, 24-hour exposure	x	x
				Total Cited By MON and EPA	**2**	**2**
				Total Number of Assays	**2**	
				Number Positive	**1**	
				Percent Positive	**50%**	
Non-Mammalian Systems *In Vivo* -- Glyphosate						
DeMarco et al. 1992	Chromosomal damage	Micronucleus formation	Negative	Plant system		
Rank et al. 1993	Chromosomal damage	Chromosomal aberrations	Negative	Plant system	x	x
Kaya et al. 2000	Mutation	SMART	Negative	Insect	x	
Kaya et al. 2000	Mutation	SMART	Positive	Insect	x	
Alvarez-Moya et al. 2011	DNA damage	DNA strand breaks, COMET	Positive	Fish assay	x	
Alvarez-Moya et al. 2011	DNA damage	DNA strand breaks, COMET	Positive	Plant system	x	
Akcha et al. 2012	DNA damage	DNA strand breaks, COMET assay	Negative	Oyster	x	
Guilherme et al. 2012b	DNA damage	DNA strand breaks, COMET assay	Positive	Fish assay	x	
Siddiqui et al. 2012	Chromosomal damage	Chromosomal aberrations	Positive	Plant system		
Frescura et al. 2013	Chromosomal damage	Chromosomal aberrations	Positive	Plant system - single dose		
Lopes et al. 2014	DNA damage	DNA strand breaks, acridine orange method	Positive	Fish assay		
Moreno et al. 2014	DNA damage	DNA strand breaks, COMET	Positive	Fish assay		
				Total Cited By MON and EPA	**7**	**1**
				Total Number of Assays	**12**	
				Number Positive	**8**	
				Percent Positive	**67%**	
Non-Mammalian Systems *In Vivo* -- AMPA						
Guilherme et al. 2014b	Chromosomal damage	Other (ENA)	Positive	Fish, highest dose only	x	
Guilherme et al. 2014b	DNA damage	DNA strand breaks, COMET	Positive	Fish	x	
				Total Cited By MON and EPA	**2**	**0**
				Total Number of Assays	**2**	
				Number Positive	**2**	
				Percent Positive	**100%**	
Non-Mammalian Systems *In Vivo* -- Formulated GBHs						
Rank et al. 1993	Chromosomal damage	Chromosomal aberrations	Positive	Plant system	x	x
Kale et al. 1995	Mutation	Sex-linked recessive lethal mutations	Positive	Insect, single dose only		
Clements et al. 1997	DNA damage	DNA strand breaks, COMET	Positive	Frog tadpole		
Grisolia 2002	Chromosomal damage	Micronucleus formation	Positive	Fish, single dose only	x	x
Conners and Black 2004	DNA damage	DNA strand breaks, COMET	Negative	Mussel larvae		
Dimitrov et al. 2006	Chromosomal damage	Chromosomal aberrations	Negative	Plant system, highest dose was toxic	x	x
Dimitrov et al. 2006	Chromosomal damage	Micronucleus formation	Negative	Plant system, highest dose was toxic	x	x
Cavas and Könen 2007	Chromosomal damage	Micronucleus formation	Positive	Fish	x	
Cavas and Könen 2007	DNA damage	DNA strand breaks, COMET	Positive	Fish	x	
Cavalcante et al. 2008	Chromosomal damage	Chromosomal aberrations	Negative	Fish, 10 mg/liter dose	x	

Citation	End-point Studied	Test/ Assay	Response/ Results	Comments	Cited by --	
					MON Reviews	EPA Sept. 2016
Cavalcante et al. 2008	DNA damage	DNA strand breaks, improved COMET assay	Positive	Fish, single dose only	x	
Cavalcante et al. 2008	Chromosomal damage	Micronucleus formation	Negative	Fish, single dose only	x	
Poletta et al. 2009	Chromosomal damage	Micronucleus formation	Positive	Caiman, in-ovo exposure	x	
Poletta et al. 2009	DNA damage	DNA strand breaks, COMET	Positive	Caiman, in-ovo exposure	x	
Guilherme et al. 2010	DNA damage	DNA strand breaks, COMET	Positive	Fish, dose-dependent response	x	
Guilherme et al. 2010	Chromosomal damage	Other (ENA)	Positive	Fish, singe dose only	x	
Mohamed 2011	DNA damage	DNA strand breaks, COMET	Positive	Snail, single dose only		
Poletta et al. 2011	Chromosomal damage	Micronucleus formation	Positive	Caiman, single dose only	x	
Poletta et al. 2011	DNA damage	DNA strand breaks, COMET	Negative	Caiman, single dose only	x	
Truta et al. 2011	Chromosomal damage	Chromosomal aberrations	(Positive)*	Plants		
Akcha et al. 2012	DNA damage	DNA strand breaks, COMET	Negative	Oyster, single dose only	x	
Guilherme et al. 2012b	DNA damage	DNA strand breaks, COMET	Positive	Fish, single dose only	x	
de Castilhos Ghisi and Cestari 2013	Chromosomal damage	Micronucleus formation	Negative	Fish, single dose only	x	
de Castilhos Ghisi and Cestari 2013	DNA damage	DNA strand breaks, COMET	Positive	Fish, single dose only	x	
De Souza Filho et al. 2013	Chromosomal damage	Micronucleus formation	Positive	Fish		
De Souza Filho et al. 2013	DNA damage	DNA strand breaks, COMET	Positive	Fish		
Gholami-Seyedkolaei et al. 2013	DNA damage	DNA strand breaks, COMET	Positive	Fish, single dose only		
Meza-Joya et al. 2013	DNA damage	DNA strand breaks, COMET	Positive	Frog		
Nwani et al. 2013	DNA damage	DNA strand breaks, COMET	Positive	Fish		
Piola et al. 2013	DNA damage	DNA strand breaks, COMET	Negative	Worm		
Piola et al. 2013	DNA damage	DNA strand breaks, COMET	Positive	Worm		
Vera-Candioti et al. 2013	Chromosomal damage	Micronucleus formation	Positive	Fish, 22.9 mg/L dose		
Vera-Candioti et al. 2013	Chromosomal damage	Micronucleus formation	Positive	Fish, 3.9 mg/liter dose		
Yadav et al. 2013	Chromosomal damage	Micronucleus formation	Positive	Frog		
Guilherme et al. 2014a	DNA damage	DNA strand breaks, improved COMET assay	Positive	Fish, single dose only	x	
Marques et al. 2014, 2015	DNA damage	DNA strand breaks, improved COMET assay	Positive	Fish, single dose only	x	
Moreno et al. 2014	DNA damage	DNA strand breaks, COMET	Positive	Fish, single dose only		
dos Santos and Martinez 2014	DNA damage	DNA strand breaks, COMET	Negative	Clam		
Muangphra et al. 2014	DNA damage	DNA strand breaks, COMET	Negative	Worm		
Muangphra et al. 2014	DNA damage	DNA strand breaks, COMET	Positive	Worm		
				Total Cited By MON and EPA	**21**	**4**
				Total Number of Assays	**40**	
				Number Positive	**29**	
				Percent Positive	**73%**	
Non-Mammalian Systems *In Vitro* -- Glyphosate						
Li and Long 1988	Differential toxicity	Rec assay	Negative	Bacteria	x	x
Li and Long 1988	Mutation	Reverse mutation	Negative	Bacteria	x	x
Li and Long 1988	Mutation	Reverse mutation	Negative	Different bacteria	x	x
Lueken et al. 2004	DNA damage	DNA strand breaks	(Negative)*	Acellular systems		
Chen et al. 2012	DNA damage	DNA strand breaks, COMET	(Positive)*	Bacteria, single dose only		
Chen et al. 2012	DNA damage	DNA strand breaks, COMET	(Positive)*	Bacteria, single dose only		
Wang et al. 2012	DNA damage	DNA strand breaks, COMET	(Positive)*	Bacteria, single dose only		
Alvarez-Moya et al. 2014	DNA damage	DNA strand breaks, COMET	Positive	Fish, dose-dependent response		x
				Total Cited By MON and EPA	**3**	**4**
				Total Number of Assays	**8**	
				Number Positive	**4**	
				Percent Positive	**50%**	
Non-Mammalian Systems *In Vitro* -- Formulated GBHs						
Rank et al. 1993	Mutation	Reverse mutation	Positive	Bacteria	x	x
Rank et al. 1993	Mutation	Reverse mutation	Positive	Bacteria	x	x
				Total Cited By MON and EPA	**2**	**2**
				Total Number of Assays	**2**	
				Number Positive	**2**	
				Percent Positive	**100%**	
				Grand Total Cited By MON and EPA	**84**	**51**
				Grand Total Assays Cited in IARC Tables: Glyphosate, AMPA and Formulated GBHs	**118**	
				Grand Total Positive	**83**	
				Grand Total Percent Positive	**70%**	

Notes:

*Indicates a positive/negative study IARC identifies as "a study with limited quality"

IARC citations are from the detailed accounting of all studies considered by the IARC Working Group in the glyphosate section of Monograph 112 Information on the studies are taken from Tables 4.1, 4.2, 4.3, 4.4, 4.5, and 4.6.

"MON Reviews" citations come from four published studies: Bruscik et al. (2016); Kier and Kirkland (2013); Heydens et al. (2008); and, Williams et al. (2000). The references in these four, Monsanto-commissioned reviews were cross-checked against the list of IARC studies.

"EPA Sept 2018" citations are from the September 12, 2016 "Glyphosate Issue Paper: Evaluation of Carcinogenic Potential." All studies cited in this EPA document, including in its Appendix F which contains studies on formulated glyphoate-based herbicides, were cross-checked against the studies cited by IARC.

Table S9. Studies Cited in Narrative Sections of IARC Monograph 112 (see notes)

Citation	Study Type	End-point Studied	Response/ Results
COMPOUND TESTED and GENOTOX ASSAY TYPE			
Glyphosate			
Human Cells *In Vitro*			
Nakashima et al. 2002	Inflammation and Immunomodulation	Cytokine Production	Positive
Kojima et al. 2004, 2010	Sex Hormone Pathway Disruption	Androgen and pregnane X disruption	Negative
Benachour et al. 2007	Sex Hormone Pathway Disruption	Aromotase disruption	Positive
Benachour et al. 2009	Cell Proliferation and Death	Cell death umbilical cord, kidney, and placental cells	Positive
Gasnier et al. 2009	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Negative
Mladinic et al. 2009b	Oxidative Stress	Oxidative DNA damage	Positive
Elie-Caille et al. 2010	Oxidative Stress	Oxidative stress	Positive
Culbreth et al. 2012	Cell Proliferation and Death	Cell proliferation in neuroprogenitor ReN CX cells	Negative
Heu et al. 2012	Cell Proliferation and Death	Cell death keratinocytes	Positive
Li et al. 2013	Cell Proliferation and Death	Cell proliferation in prostate and ovary cells	Positive
Mesnage et al. 2013a	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Negative
Thongprakaisang et al. 2013	Cell Proliferation and Death	Breast cancer cells	Positive
Thongprakaisang et al. 2013	Sex Hormone Pathway Disruption	Estrogen Response Element	Positive
Chaufan et al. 2014	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Negative
Chaufan et al. 2014	Oxidative Stress	Oxidative stress	Negative
Kwiatkowska et al. 2014	Oxidative Stress	Oxidative DNA damage	Positive
		Number	**16**
		Number Positive	**10**
		Percent Positive	**63%**
Non-Human Mammals *In Vivo*			
Vainio et al. 1983	Other Pathways	Peroxisome disruption	Negative
Chan and Mahler 1992	Inflammation and Immunomodulation	Pathological effects on immune system	Positive
Astiz et al. 2009a	Cell Proliferation and Death	Cell death in brain and liver cells	Positive
Kumar et al. 2014	Inflammation and Immunomodulation	Pulmonary inflammation	Positive
		Number	**4**
		Number Positive	**3**
		Percent Positive	**75%**
Non-Human Mammals *In Vitro*			
Bolognesi et al. 1997	Oxidative Stress	Oxidative stress	Positive
Walsh et al. 2000	Sex Hormone Pathway Disruption	Steroidogenesis disruption	Negative
Richard et al. 2005	Sex Hormone Pathway Disruption	Aromotase disruption	Positive
Benachour et al. 2007	Sex Hormone Pathway Disruption	Aromotase disruption	Positive
Astiz et al. 2009b	Oxidative Stress	Oxidative stress	Positive
George et al. 2010	Oxidative Stress	Oxidative stress	Positive
Kojima et al. 2010	Other Pathways	Peroxisome disruption	Negative
Takeuchi et al. 2008	Other Pathways	Aryl hydrocarbon receptor disruption	Negative
Forgacs et al. 2012	Sex Hormone Pathway Disruption	Testosterone disruption	Negative
Clair et al. 2012	Cell Proliferation and Death	Cell-membrane alterations	Negative
Culbreth et al. 2012	Cell Proliferation and Death	Neuroprogenitor cell line	Negative
Gui et al. 2012	Cell Proliferation and Death	Cell death pheochromocytoma PC12 cells	Positive
Kim et al. 2013	Cell Proliferation and Death	Cell death in H9c2 heart cells	Positive
Zhao et al. 2013	Cell Proliferation and Death	Cell death Sertoli cells	Positive
		Number	**14**
		Number Positive	**8**
		Percent Positive	**57%**

Citation	Study Type	End-point Studied	Response/ Results
Non-Mammalian *In Vivo*			
Xie et al. 2005	Sex Hormone Pathway Disruption	Plasma vittelogenin levels	Negative
Costa et al. 2008	Oxidative Stress	Oxidative stress	Positive
Lushchark et al. 2009	Oxidative Stress	Oxidative stress	Positive
Slaninova et al. 2009	Oxidative Stress	Oxidative stress	Positive
Ferreira et al. 2010	Oxidative Stress	Oxidative stress	Positive
Guilherme et al. 2010	Oxidative Stress	Oxidative stress	Positive
Modesto and Martinez et al. 2010	Oxidative Stress	Oxidative stress	Positive
Cattaneo et al. 2011	Oxidative Stress	Oxidative stress	Positive
Glusczak et al. 2011	Oxidative Stress	Oxidative stress	Positive
de Menezes et al. 2011	Oxidative Stress	Oxidative stress	Positive
Kreutz et al. 2011	Inflammation and Immunomodulation	Immunotoxicity	Positive
Ortiz-Ordoñez et al. 2011	Oxidative Stress	Oxidative stress	Positive
Guilherme et al. 2012a, 2012b	Oxidative Stress	Oxidative stress	Positive
Geret et al. 2013	Oxidative Stress	Oxidative stress	Positive
Nwani et al. 2013	Oxidative Stress	Oxidative stress	Positive
Guilherme et al. 2014a, 2014b	Oxidative Stress	Oxidative stress	Positive
Marques et al. 2014, 2015	Oxidative Stress	Oxidative stress	Negative
Sinhorin et al. 2014	Oxidative Stress	Oxidative stress	Positive
Uren Webster et al. 2014	Oxidative Stress	Oxidative stress	Positive
		Number	**19**
		Number Positive	**17**
		Percent Positive	**89%**
All Glyphosate			
		Number	**53**
		Number Positive	**38**
		Percent Positive	**72%**
AMPA			
Human Cells *In Vitro*			
Li et al. 2013	Cell Proliferation and Death	Cell proliferation in prostate and ovary cells	Positive
Chaufan et al. 2014	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Negative
Chaufan et al. 2014	Oxidative Stress	Oxidative stress	Negative
Kwiatkowska et al. 2014	Oxidative Stress	Oxidative DNA damage	Positive
All AMPA			
		Number	**4**
		Number Positive	**2**
		Percent Positive	**50%**
Formulated GBHs			
Human Cells *In Vitro*			
Gehin et al. 2005	Oxidative Stress	Oxidative stress	Positive
Richard et al. 2005	Sex Hormone Pathway Disruption	Aromotase disruption	Positive
Benachour et al. 2007	Sex Hormone Pathway Disruption	Aromotase disruption	Positive
Benachour et al. 2009	Cell Proliferation and Death	Cell death umbilical cord, kidney, and placental cells	Positive
Gasnier et al. 2009	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Positive
Gasnier et al. 2009	Sex Hormone Pathway Disruption	Aromotase disruption	Negative
Gasnier et al. 2010	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Positive
George and Shukla 2013	Cell Proliferation and Death	Cell proliferation in HaCaT keratinocytes	Positive
George and Shukla 2013	Oxidative Stress	Oxidative stress	Positive
Mesnage et al. 2013a	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Positive
Chaufan et al. 2014	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Positive
Chaufan et al. 2014	Oxidative Stress	Oxidative stress	Positive
Coalova et al. 2014	Cell Proliferation and Death	Cell death HepG2 hepatoma cell line	Positive
Coalova et al. 2014	Oxidative Stress	Oxidative stress	Positive
		Number	**14**
		Number Positive	**13**
		Percent Positive	**93%**

Citation	Study Type	End-point Studied	Response/ Results
Non-Human Mammals *In Vivo*			
Blakley et al. 1997	Inflammation and Immunomodulation	Humoral immune response	Negative
		Number	**1**
		Number Positive	**1**
		Percent Positive	**100%**
Non-Human Mammals *In Vitro*			
Bolognesi et al. 1997	Oxidative Stress	Oxidative stress	Positive
Walsh et al. 2000	Sex Hormone Pathway Disruption	Progesterone disruption	Positive
Malatesta et al. 2008	Cell Proliferation and Death	Cell death hepatoma HTC cells	Negative
Çavuşoğlu et al. 2011	Oxidative Stress	Oxidative stress	Positive
Clair et al. 2012	Cell Proliferation and Death	Cell-membrane alterations	Positive
Martini et al. 2012	Cell Proliferation and Death	Cell death 3T3-L1 fibroblasts	Positive
Cattani et al. 2014	Oxidative Stress	Oxidative stress	Positive
		Number	**7**
		Number Positive	**6**
		Percent Positive	**86%**
Non-Mammalian Systems *In Vivo*			
el-Gendy et al. 1998	Inflammation and Immunomodulation	Humoral and cellular immune response	Positive
Paganelli et al. 2010	Sex Hormone Pathway Disruption	Retinioc acid signalling disfuntion	Positive
Omran and Salama 2013	Sex Hormone Pathway Disruption	Testosterone 17β-estradiol and total microsomal protein disruption	Positive
		Number	**3**
		Number Positive	**3**
		Percent Positive	**100%**
All Formulated GBHs			
		Number	**25**
		Number Positive	**23**
		Percent Positive	**92%**
All Categories: Glyphosate, AMPA and Formulated GBHs			
		Number	**82**
		Number Positive	**63**
		Percent Positive	**77%**

Notes: This table describes studies cited in the narrative of sections 4.2.2, 4.2.3, and 4.2.4 of IARC Monograph 112 that relate to mechanisms of genotoxicity other than those listed in the tables.

Supplemental Table 10. Total Regulatory and Public Literature Assays Cited by EPA 2016 and IARC 2017

Compound Tested	EPA 2016		IARC 2017		Total Regulatory	Total Public Literature
	Regulatory	Public Literature	Tables	Narrative		
GENOTOX ASSAY TYPE						
Bacterial Mutation						
Glyphosate	23	4	2		23	4
Number Positive	0	0	0		0	0
Formulated GBHs	28	3	2		28	3
Number Positive	0	1	1		0	1
I*n Vitro* and *In Vivo* Mammalian Gene Mutation						
Glyphosate	4	0	2		4	2
Number Positive	0	0	1		0	1
Formulated GBHs	0	0	1		0	1
Number Positive	0	0	1		0	1
***In Vitro* Chormosomal Aberration**						
Glyphosate	4	4	5		4	6
Number Positive	0	3	2		0	3
AMPA	0	0	1		0	1
Number Positive	0	0	1		0	1
Formulated GBHs	0	5	3		0	5
Number Positive	0	3	2		0	3
***In Vitro* Micronuclei Induction in Mammalian Cells**						
Glyphosate	0	6	3		0	6
Number Positive	0	4	3		0	4
***In Vivo* Chromosomal Aberration**						
Glyphosate	5	0	2		5	2
Number Positive	0	0	2		0	2
Formulated GBHs	0	3	5		0	8
Number Positive	0	2	3		0	6
***In Vivo* Micronucliei Induction**						
Glyphosate	14	4	5		14	6
Number Positive	1	1	2		1	2
AMPA	0	0	1		0	1
Number Positive	0	0	1		0	1
Formulated GBHs	15	6	13		15	16
Number Positive	0	2	8		0	9
Assays for Detecting Primary DNA Damage						
Glyphosate	2	13	25		2	27
Number Positive	0	11	21		0	23
AMPA	0	0	3		0	3
Number Positive	0	0	3		0	3
Formulated GBHs	0	8	36		0	38
Number Positive	0	8	32		0	33
Other Mechanisms*						
Glyphosate				53		53
Number Positive				38		38
AMPA				4		4
Number Positive				2		2
Formulated GBHs				25		25
Number Positive				23		23

Totals	EPA Regulatory	EPA Public Literature	IARC Tables + Narrative	All Regulatory	All Public Literature	All Assays
Glyphosate, AMPA and GBHs			(total assays in tables=109, narrative= 82)			
Number of assays	**95**	**56**	**191**	**95**	**211**	**306**
Number positive	**1**	**35**	**146**	**1**	**156**	**157**
Percent positive	**1%**	**63%**	**76%**	**1%**	**74%**	**51%**
Total Glyphosate	**52**	**31**	**97**	**52**	**106**	**158**
Number positive	**1**	**19**	**69**	**1**	**73**	**74**
Percent positive	**2%**	**61%**	**71%**	**2%**	**69%**	**47%**
Total AMPA	**0**	**0**	**9**	**0**	**9**	**9**
Number positive	**0**	**0**	**7**	**0**	**7**	**7**
Percent positive	**0%**	**0%**	**78%**	**0%**	**78%**	**78%**
Total Formulated GBHs	**43**	**25**	**85**	**43**	**96**	**139**
Number positive	**0**	**16**	**70**	**0**	**76**	**76**
Percent positive	**0%**	**64%**	**82%**	**0%**	**79%**	**55%**

*Studies in Supplemental Table 9 that were from the narrative section of the IARC Monograph involve other mechanisms of genotoxicity that do not fit the EPA categories.

Table S11. Assays Considered in Core Tables by IARC But Not EPA, and By EPA But Not IARC [EPA 2016 and IARC 2017]

Compound Tested	Assays Considered by IARC and Not by EPA		Assays Considered by EPA and Not by IARC	
	Number	Number Positive	Number	Number Positive
GENOTOX ASSAY TYPE				
Bacterial Reverse Mutation				
Glyphosate	0	0	25	0
Formulated GBHs	0	0	29	0
***In Vitro* and *In Vivo* Mammalian Gene Mutation**				
Glyphosate	2	1	4	0
Formulated GBHs	1	1	0	0
***In Vitro* Chromosomal Aberration**				
Glyphosate	1	0	5	1
AMPA	1	1	0	0
Formulated GBHs	0	0	1	0
***In Vitro* Micronuclei Induction in Mammalian Cells**				
Glyphosate	0	0	3	1
***In Vivo* Chromosomal Aberration**				
Glyphosate	2	2	5	0
Formulated GBHs	3	2	1	1
***In Vivo* Micronuclei Induction in Cells**				
Glyphosate	2	1	15	1
AMPA	1	1	0	0
Formulated GBHs	8	7	16	0
Primary DNA Damage				
Glyphosate	14	12	4	2
AMPA	3	3	0	0
Formulated GBHs	29	24	1	1
Totals All Categories	**67**	**55**	**109**	**7**
Percent Positive	**82%**		**6%**	
Totals Glyphosate Technical	**21**	**16**	**61**	**5**
Percent Positive	**76%**		**8%**	
Totals AMPA	**5**	**5**	**0**	**0**
Percent Positive	**100%**		**0%**	
Totals Formulated GBHs	**41**	**34**	**48**	**2**
Percent Positive	**83%**		**4%**	
Number Regulatory	**0**	**0**	**95**	**1**
Percent Positive	**0%**		**1%**	
Number Public Literature	**67**	**55**	**14**	**6**
Percent Positive	**82%**		**43%**	

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