Overview of this case:
Overview of this case:
Overview of this case:
Overview of this case:
Not the first lawsuit:
How the trial works:

1. Opening statements
2. Plaintiff’s case
3. Monsanto’s case
4. Rebuttal (possible)
5. Closing arguments
6. Deliberations
Current & Former Employees
Current & Former Employees

Dr. Mark Martens
Toxicology Director (former)

Dr. David Saltmiras
Toxicology Manager

Dr. John Acquavella
Epidemiologist (former)
Current & Former Employees
Current & Former Employees

Daniel Jenkins
Manager for Regulatory Affairs

David Heering
Strategy, Compliance, Operations
Lead
Current & Former Employees

Steve Gould
National Accounts Manager (includes California)

Dr. Kirk Azevedo
Sales Representative (former)
Opening Statement Roadmap:

1. What is Roundup?
2. Can Roundup cause cancer?
3. Did Roundup cause Mr. Johnson’s cancer?
4. What are Mr. Johnson’s damages?
5. Should Monsanto be punished for its conduct?
Opening Statement Roadmap:

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1. What is Roundup?
1. What is Roundup?

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<thead>
<tr>
<th>ACTIVE INGREDIENT:</th>
<th>OTHER INGREDIENTS:</th>
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<td>*Glyphosate, N-(phosphonomethyl)glycine, in the form of its potassium salt.</td>
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1. What is Roundup?

Glyphosate

![Image of industrial equipment]

Glypohosate chemical structure:

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O
P
O-CH₂
\text{NH-CH₂-COO}⁻
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*glyphosate*
1. What is Roundup?

**Surfactant**

**ACTIVE INGREDIENT:**
*Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt* ................................................................. 41.0%

**OTHER INGREDIENTS (including surfactant):** .......................... 59.0%

100.0%

POlyEthoxylated tallow Amine
1. What is Roundup?

**Surfactant**

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100.0%
1. What is Roundup?
1. What is Roundup?

Penetrates the surface of a leaf, but also human skin
1. What is Roundup?

From: HEYDENS, WILLIAM F [AG/1000]
Sent: Thursday, August 06, 2015 9:55 AM
To: 'Ashley Roberts Intertek'; FARMER, DONNA R [AG/1000]
Subject: RE: Keith

Ashley,
I think the short answer is no. The focus of this is what is the carcinogenic potential of glyphosate.

That said, the surfactant in the formulation will come up in the tumor promotion skin study because we think it played a role there.

-----Original Message-----
From: Ashley Roberts Intertek [mailto@intertek.com]
Sent: Thursday, August 06, 2015 09:47 AM Central Standard Time
To: FARMER, DONNA R [AG/1000]; HEYDENS, WILLIAM F [AG/1000]
Subject: Keith

Hi Donna/Bill,

Just received a question from Keith in response to my email message on the exposure piece this morning.

He has asked if we need to give any consideration to exposures of formulates in the commercial product, at least in applicators? I was under the impression these were inert but reading a response this morning in the Ecologist makes it sound like it is the combination that is toxic!!!

What do you think?
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Sent: Thursday, August 06, 2015 09:47 AM Central Standard Time
To: FARMER, DONNA R [AG/1000]; HEYDENS, WILLIAM F [AG/1000]
Subject: Keith

Hi Donna/Bill,
1. **What is Roundup?**

**ACTIVE INGREDIENT:**
*Glyphosate, N-(phosphonomethyl)glycine, in the form of its potassium salt* ......................................................... 48.7%

**OTHER INGREDIENTS:** ......................................................................................................................... 51.3%

100.0%

---

**ACTIVE INGREDIENT:**
*Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt* ......................................................... 41.0%

**OTHER INGREDIENTS (including surfactant):** ......................................................................................... 59.0%

100.0%
Opening Statement Roadmap:

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2. Can Roundup cause cancer?

Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
3. Epidemiology
Plaintiff’s Experts

Christopher Portier, PhD.

- Ph.D. in Biostatistics, University of North Carolina School of Public Health (1981). Thesis addressed the best way to design a two-year rodent study to assess the ability of a chemical to cause cancer.

- Former Associate Director of the National Toxicology Program (NTP)

- Former Associate Director of National Institutes of Health

- Former Director of the National Center for Environmental Health (NCEH) at the Centers for Disease Control and Prevention (CDC)

- Former Director of the Agency for Toxic Substances and Disease Registry (ATSDR)
Alfred Neugut, M.D., PhD.

- Professor of Cancer Research and Professor of Medicine and Epidemiology at Columbia University
- Director of Junior Faculty Development for the Department of Epidemiology at Columbia University
- Medical oncologist with a Ph.D. in Pathology (1977) and M.P.H. in Epidemiology (1983) from the University of Columbia
- Published over 500 peer reviewed chapters and papers and received over $50 million in funding from the National Cancer Institute, American Cancer Society, and Department of Defense
2. Can Roundup cause cancer?

Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
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Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
3. Epidemiology
2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

- **Control**
- **Low Dose**
- **Mid Dose**
- **High Dose**

- Significant increases in tumors
- Replication
- Dose response
- Cross-species
- Rare tumors

Glyphosate only

Long term – typically, 2 years
2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

Admission No. 7
Monsanto admits that it did not conduct any further long-term carcinogenicity animal studies after 1991.

- Significant increases in tumors
- Replication
- Dose response
- Cross-species
- Rare tumors
2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

### Mice Studies – Tumor Chart

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<td>Spleen composite lymphosarcoma</td>
<td>Hemangiosarcoma</td>
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<td>Hemangiosarcoma</td>
<td>Lung adenocarcinoma</td>
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<td>Harderian gland adenoma</td>
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2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

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2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

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<td>Knezevich &amp; Hogan (1983)</td>
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<td>Spleen composite lymphosarcoma</td>
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<tr>
<td>Atkinson (1993)</td>
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<td>Metastatic lymphoma</td>
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<td>Sugimoto (1997)</td>
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<tr>
<td>Lung adenocarcinoma</td>
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<td>Wood (2009)</td>
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<tr>
<td>Hemangiosarcoma</td>
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<tr>
<td>Kumar (2001)</td>
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<tr>
<td>Hemangioma</td>
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</table>

*Table showing the results of animal carcinogenicity studies.*
2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Tumor Type</th>
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<tbody>
<tr>
<td>Knezevich &amp; Hogan (1983)</td>
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2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

George Study (2010)

- Applied to skin 3x week
- 40% of mice exposed to glyphosate had tumors in skin
- 0% of control group had tumors in skin

Evidence that glyphosate is a tumor promoter
2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

- Glyphosate only
- Long term – typically, 2 years

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2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

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<td>Lankas (1981)</td>
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<td>Testicular interstitial cell tumors</td>
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<td>Stout &amp; Ruecker (1990)</td>
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<td>Thyroid C-Cell carcinomas or adenomas</td>
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2. Can Roundup cause cancer?

1. Animal Carcinogenicity Studies

### Rat Studies – Tumor Chart

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1. Animal Carcinogenicity Studies

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2. Can Roundup cause cancer?

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Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
3. Epidemiology
2. Can Roundup cause cancer?

Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies

2. Mechanistic Data

3. Epidemiology
2. Can Roundup cause cancer?

2. Mechanistic Data

Mechanistic Data:
Refers to the way in which a substance can cause cancer.
2. Can Roundup cause cancer?

2. Mechanistic Data

Genotoxicity:
The property of chemical agents that damage the genetic information within a cell that can cause mutations.

Oxidative Stress:
An imbalance between the production of free oxygen particles and the ability of the body to counteract their harmful effects with antioxidants.
2. Can Roundup cause cancer?

2. Mechanistic Data
Can Roundup cause cancer?

Mechanistic Data

Different methods of testing DNA damage
Over 100 different studies
- Both Roundup & glyphosate
- In humans (*vivo* & *vitro*)
- Non-human mammals (*vivo* & *vitro*)
- Non-mammals (*vivo* & *vitro*)

**In vivo:**
In a living organism.

**In vitro:**
In glass, as in a test tube.
2. Can Roundup cause cancer?

2. Mechanistic Data

In the 1990’s four published genotoxicity studies Rank, Bolognesi, Lioi, & Peluso prompted Monsanto to hire an independent genotox expert
Rank study shows that Roundup exposure, as opposed to glyphosate alone, causes elevated increases of DNA damage.
Rank study shows that Roundup exposure, as opposed to glyphosate alone, causes elevated increases of DNA damage.

Bolognesi study shows that Roundup formulation causes genetic damage in human cells.
Genotoxic Activity of Glyphosate and Its Technical Formulation Roundup

Claudia Bolognesi,* Stefania Bonatti, Paolo Degani, Elena Gallerani, Marco Peluso, Roberta Rabboni, Paola Raggieri, and Angelo Abbondandolo

Centro Nazionale per lo Studio dei Tumori di Origine Ambientale, Istituto Nazionale per la Ricerca sul Cancro, Largo Rosanna Benzi 10, 16132 Genova, Italy

Glyphosate (N-phosphonomethylglycine) is an effective herbicide acting on the synthesis of aromatic amino acids in plants. The genotoxic potential of this herbicide has been studied: the results available in the open literature reveal a weak activity of the technical formulation. In this study, the formulated commercial product, Roundup, and its active agent, glyphosate, were tested in the same battery of assays for the induction of DNA damage and chromosomal effects in vivo and in vitro. Swiss CD1 mice were treated intraperitoneally with test substances, and the DNA damage was evaluated by alkaline elution technique and 8-hydroxydeoxyguanosine (8-OHdG) quantification in liver and kidney. The chromosomal damage of the two pesticide preparations was also evaluated in vivo in bone marrow of mice as micronucleus frequency and in vitro in human lymphocyte culture as SCE frequency. A DNA-damaging activity as DNA single-strand breaks and 8-OHdG and a significant increase in chromosomal alterations were observed with both substances in vivo and in vitro. A weak increment of the genotoxic activity was evident using the technical formulation.

Keywords: Pesticides; in vivo genotoxicity; in vitro genotoxicity; SCE; micronucleus test; alkaline elution; DNA oxidative damage

INTRODUCTION

Roundup, an extremely effective nonselective postemergence herbicide, is a combination of an active ingredient, the isopropylamine salt of glyphosate, and a surface-active agent that enhances the spreading of the spray solution over the target plant. Glyphosate was shown to be nonmutagenic and nongenotoxic in a number of in vitro and in vivo systems, as well as the absence of transplacental toxicity in rabbits (DeVito et al., 1985), but Roundup has been identified as a causative irritation phenomenon or contact dermatitis, reported in occupationally exposed agricultural workers (Bolognesi et al., 1988).

The formulated commercial product, Roundup, showed to be mutagenic in tests than the nonformulated product, and the metabolic activation system of the test system in vitro and in vivo, suggesting that the genotoxic potential of Roundup can be enhanced by metabolic activation of residues after application. The presence of a surface-active agent seems to be important in the genotoxicity of Roundup formulations.
Genotoxic Activity of Glyphosate and Its Technical Formulation Roundup

Claudia Bolognesi, Stefania Bonatti, Paolo Degani, Elena Gallerani, Marco Peluso, Roberta Rabboni, Paola Raggieri, and Angelo Abbondandolo

Centro Nazionale per lo Studio dei Tumori di Origine Ambientale, Istituto Nazionale per la Ricerca sul Cancro, Largo Rosanna Benzi 10, 16132 Genova, Italy

Glyphosate (N-phosphonomethylglycine) is an effective herbicide acting on the synthesis of aromatic amino acids in plants. The genotoxic potential of this herbicide has been studied: the results available in the open literature reveal a weak activity of the technical formulation. In this study, the formulated commercial product, Roundup, and its active agent, glyphosate, were tested in the same battery of assays for the induction of DNA damage and chromosomal effects in vivo and in vitro. Swiss CD1 mice were treated intraperitoneally with test substances, and the DNA damage was evaluated by alkaline elution technique and 8-hydroxydeoxyguanosine (8-OHdG) quantification in liver and kidney. The chromosomal damage of the two pesticide preparations was also evaluated in vivo in bone marrow of mice as micronucleus frequency and in vitro in human lymphocytes culture as SCE frequency. A DNA-damaging activity as DNA single-strand breaks and 8-OHdG and a significant increase in chromosomal alterations were observed with both substances in vivo and in vitro. A weak increment of the genotoxic activity was evident using the technical formulation.

Keywords: Pesticides; in vivo genotoxicity; in vitro genotoxicity; SCE; micronucleus test; alkaline elution; DNA oxidative damage

INTRODUCTION

Roundup, an extremely effective nonselective postemergence herbicide, is a combination of an active ingredient, the isopropylamine salt of glyphosate, and a surface-active agent that enhances the spreading of the herbicide formula on the plant surface (2, 3). Despite its efficacy, Roundup has been identified as a cause of irritation phenomenon or contact dermatitis, reported in occupationally exposed agricultural workers (1, 4, 5, 6, 7, 8, 9).

The formulated commercial product, Roundup, as indicated by authors, contains as the major component, glyphosate. The International Agency for Research on Cancer (IARC) decided to classify glyphosate as probably carcinogenic to humans (Group 2A) in 1985. However, the IARC was not able to establish a causal relationship between glyphosate exposure and health effects in humans. Most studies of human exposure have reported no increased risk of cancer, and results from epidemiological studies have been inconsistent (9, 10, 11).
Jan 1992

Rank study shows that Roundup exposure, as opposed to glyphosate alone, causes elevated increases of DNA damage.

Mar 1997

Bolognesi study shows that Roundup formulation causes genetic damage in human cells.
Lioi study shows that glyphosate induces cell stress in animal cells.
Dec 1998

Peluso study shows that Roundup exposure induces “dose dependent” DNA damage in mice.

Jul 1998

Lioi study shows that glyphosate induces cell stress in animal cells.
Dec 1998

Peluso study shows that Roundup exposure induces “dose dependent” DNA damage in mice.

Monsanto’s Reaction:
Need to hire an expert to refute these studies, so Monsanto reaches out to Dr. James Parry.

Jul 1998

Lioi study shows that glyphosate induces cell stress in animal cells.
Dec 1998  

Mechanistic: Peluso study shows that Roundup exposure induces "dose dependent" DNA damage in mice.

Jul 1998  

Lioi study shows that glyphosate induces cell stress in animal cells.

Dec 1998  

Monsanto’s Reaction: Need to hire an expert to refute these studies, so Monsanto reaches out to Dr. James Parry.

Subject: Actions from 12/12 Meeting on Mutagenicity  
Author: [Redacted]  
date: 12/23/98 1:31 PM

6) Agreed an external global network of genotox experts needs to be developed.

MCI has an immediate need and is a critical area now it was agreed that [Redacted] would contact Dr. Parry next week to discuss with him his participation in the support of glyphosate, glyphosate-based ***formulations*** genotox issues.

After initial contact, if Dr. Parry is agreeable then [Redacted] will be included in discussion to outline issues/needs etc.

For North America - [Redacted] will be here in early February as part of the Sandoz project. [Redacted] as previously agreed to join in those discussions.

Unfortunately our time paths did not match [Redacted] and [Redacted] stayed a little while longer and discussed the [Redacted] papers.

- The data are very unusual and suspect (i.e., the results may reflect an artifact of some procedural error and/or inexperience in scoring) but may be extremely difficult to refute based simply on the contents of the paper.

- It is a real concern that these papers may create an even bigger problem for us than the [Redacted] paper. Therefore we do some things quickly!

- The results of the human lymphocyte test by [Redacted] do not agree with the [Redacted] paper. Therefore we do some things quickly!
Dec 1998: Peluso study shows that Roundup exposure induces “dose dependent” DNA damage in mice.

Dec 1998: Monsanto’s Reaction: Need to hire an expert to refute these studies, so Monsanto reaches out to Dr. James Parry.

Jul 1998: Lioi study shows that glyphosate induces cell stress in animal cells.
Dr. James Parry

- Author of two influential textbooks “Comparative Genetic Toxicology” and “Principles and Methods of Genetic Toxicology”
- Published over 300 papers on toxicology
- Founder of Journal “Mutagenesis” and the “European Journal of Molecular Genetics and Toxicology”
- President of the European Environmental Mutagen Society
Dr. James Parry

Monsanto Unsure About Dr. Parry

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6). External global network of genotox experts:

- EU
  - While Dr. Parry is a recognized genotox expert what is not known is how he views some of the non-standard end-points (such as H2X, rat vs human genotyping, comet assays etc) evaluated in the genotox articles by Bank, Bologna, etc.
  - Therefore it was recommended that before we ask him to get more deeply involved (reviewing all the literature, genotox data, etc) we ask him to review a subset of the articles.
  - It was proposed that [redacted] would contact Dr. Parry and ask him for a written review the articles by Bank, Bologna, Feluda & Lioi.
  - Based on his critique of the genotox papers a decision would be made as to expanding or terminating his involvement.
  - Regarding [redacted] no further contact will be made at this time. When a clear role has been identified for [redacted] Alan will contact him.
  - Money for this initial consultation will come from [redacted]. A bigger initiative will require additional funds to be located.

WA
- Expanded discussions with Dr. Gary Williams on genotox issues will occur as part of the CANTOX meetings (2/5, 6/7). Dr. Williams is recognized internationally as a genotox expert and might be used in Europe on a contingency basis.

LA/SEA - no action at this time

7). There is a concern that the papers by Lioi et al. may present an even bigger problem because the studies are with glyphosates and are on a non-standard end-points. The results of the human lymphocyte test by Lioi do not agree with the toxicity and data in the human lymphocyte study by Agrichem at BETOX. Therefore it was recommended that:

- Larry Kier will finalize his rebuttal
- Include the Lioi papers in the articles to be reviewed by Dr. Parry
- Bill/Donna will draft for Larry a letter to the editor or a short publication to be submitted to the Journal upon receipt of Parry’s evaluation

8). While there is $90K in the glyphosate toxicity testing budget for mutagenicity testing, this may not be enough. Further
6). External global network of genotox experts:

- EU

- While Dr. Parry is a recognized genotox expert what is not known is how he views some of the "non-standard endpoints" (such as SCE, DNA P-32 postlabeling, Comet assays etc) evaluated in the genotox articles by Rank, Bolognesi etc.
- Therefore it was recommended that before we ask him to get more deeply involved (reviewing all the literature, glyphosate data; represent us as a consultant with regulators, etc) we would ask him to review a subset of the articles.
- It was proposed that [REDACTED] would contact Dr. Parry and ask him for a written review the articles by Rank, Bolognesi, Peluso & Lioi.
- Based on his critique of the the genotox papers a decision would be made as to expanding or terminating his involvement.
- Regarding [REDACTED], no further contact will be made at this time. When a clear role has been identified for [REDACTED] Alan will contact him.
- Money for this initial consultation will come from [REDACTED] budget. A bigger initiative will require additional funds to be located.

- NA

- Expanded discussions with Dr. Gary Williams on genotox issues will occur as part of the CANTOX meetings (2/5, 6&7). Dr. Williams is recognized internationally as a genotox expert and might be used in Europe on a contingency basis.
Dr. James Parry

Monsanto Unsure About Dr. Parry

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Expanded discussions with Dr. Gary Williams on genotox issues will occur as part of the CANTOX meetings (2/5, 6&7). Dr. Williams is recognized internationally as a genotox expert and might be used in Europe on a contingency basis.

LA/SEA - no action at this time

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7). There is a concern that the papers by Lioi et al, may present an even bigger problem because the studies are with glyphosate and are on a more standard endpoints. The results of the human studies are not consistent with the animal and the molecular findings...
4) The development of a "positive" press release was requested. Please comment on the DRAFT below:

"Several genotoxicity studies have been conducted on glyphosate, the surfactants in glyphosate formulations, and other closely-related surfactants. Studies have also been performed on Roundup herbicide and other glyphosate formulations. None of these studies have shown any adverse findings. Based on all these results, we are confident that glyphosate herbicide products are not genotoxic and therefore to not present a mutagenic or carcinogenic risk to humans and animals. We will continue to diligently consider concerns raised in this area and will support our conclusions on the safety of Roundup herbicides with appropriate scientific..."
Dec 1998

Peluso study shows that Roundup exposure induces “dose dependent” DNA damage in mice.

Jul 1998

Lioi study shows that glyphosate induces cell stress in animal cells.

Monsanto’s Reaction: Need to hire an expert to refute these studies, so Monsanto reaches out to Dr. James Parry.
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Monsanto’s Reaction: Need to hire an expert to refute these studies, so Monsanto reaches out to Dr. James Parry.

Jul 1998

Lioi study shows that glyphosate induces cell stress in animal cells.
Feb 1999

Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.
You will find enclosed my evaluation of the four papers you provided concerning the potential genotoxicity of glyphosate and Roundup. Although each of the papers have weaknesses, I have avoided a report which attempts to focus upon these weaknesses. Rather, I have attempted to "pull out" the data which provide an aid to the understanding of the potential mechanisms of glyphosate genotoxicity and indicated how you might clarify these mechanisms. It has been my experience with Regulatory Agencies that a positive attitude to published data is a more productive approach than just criticizing individual studies.

I assume that you will already have in-house data for some of the suggested experiments. In my view the in vivo micronucleus work suggested would be the most productive way of clarifying the question of mechanisms. I would be happy to provide you with further suggestions as to detailed protocols for such studies. They would make a rather nice Ph.D project for a graduate student if you could find the funding.

I have enclosed my invoice for the evaluation.

Yours sincerely
Feb 1999

Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.
Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.

The overall data provided by the four publications provide evidence to support a model that Glyphosate is capable of producing genotoxicity both in vivo and in vitro by a mechanism based upon the production of oxidative damage. If confirmed, such a mechanism of genotoxic damage would be expected to be produced at high concentrations of the herbicide and would be adverse only when the anti-oxidant protective mechanisms of the soil are overwhelmed. Thus, it would conclude that if the mechanism of action can be proved to be based upon oxidative damage then impact and risk assessments could be based upon a non-linear model with a threshold of activity at low doses.

Questions raised by the studies

1. Role of components of soils which lead to high levels of activity of Glyphosate?
2. Is the genotoxic activity observed due to oxidative damage?
3. Can the genotoxic activity be reduced by anti-oxidants?

Recommendations for further work to identify the potential genotoxic activity of...
Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.

Questions raised by the meeting:

1. Role of components of mixture which leads to high levels of activity of Roundup?
2. Is the genotoxic activity observed due to oxidative damage?
3. Can the genotoxic activity be induced by anti-oxidants?

Recommendations for further work to identify the potential genotoxic activity of glyphosate:

Bacteria:

I recommend a review of bactericidal studies, particularly with Roundup-mixed. It would be surprising if these data are not already available in form.

Cytogenics:

I recommend an in vivo micronucleus study preferably in human lymphocytes. If combined with analysis of the microsomal for the presence and absence of mutagenic DNA, this study would indicate whether glyphosate induces predominantly chromosome structural
Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.
Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.

The in vitro micronucleus assay would allow both:


b) Assessment of the individual components of the Roundup mixture to determine whether there is any component(s) which are synergistically to increase the potential genotoxicity of Glyphosate. Such studies could be designed to investigate a panel of measures leaving one component of the mix for each individual experiment.

In vivo studies

In view of the limitations of the Lai et al. (1998) study i.e.

- limited number of animals
- single dose of compound
- low spontaneous micronucleus frequency

It would be worth repeating the study in a more comprehensive design.

To assess both the DNA repair bands and Ames work would receive very large
Feb 1999

Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.
Feb 1999
Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.

Apr 1999
Monsanto Reaction: Monsanto decides to give Dr. Parry more data with the hope of turning him around.
4. Global experts

Dr. Parry’s analysis - what is our next step?

Dr. Parry concluded on his evaluation of the four articles that glyphosate is capable of producing genotoxicity both in vivo and in vitro by a mechanism based upon the production of oxidative damage.

The data that Dr. Parry evaluated is limited and is not consistent with other better conducted studies. In order to move Dr. Parry from his position we will need to provide him with the additional information as well as asking him to critically evaluate the quality of all the data including the open literature studies.

As a follow-up, Mark will contact Dr. Parry, discuss with him the existence of additional data and ask him to evaluate the ProT package. Mark will also explore his interest (if we can turn his opinion around) in being a spokesperson for us for these type of issues.

Larry as well as others will be available to discuss the data with Parry as needed by e-mail, phone or in person or all the above.

Dr. will meet - discuss the outcome of the caucus meeting

The panel concluded that glyphosate and Roundup were not mutagenic. That in the evaluation of these types of studies criteria should be set up front in the evaluation process as to what makes an acceptable study and what does not - this is to be included in the manuscript as well as a weight of evidence approach.

II) What followup
Feb 1999
Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.

Apr 1999
Monsanto Reaction:
Monsanto decides to give Dr. Parry more data with the hope of turning him around.
Feb 1999  Dr. Parry submits his first internal report, concluding glyphosate is genotoxic.

Apr 1999  Monsanto Reaction: Monsanto decides to give Dr. Parry more data with the hope of turning him around.
Aug 1999

Dr. Parry submits second comprehensive report.
Aug 1999

Dr. Parry submits second comprehensive report.

Clastogen:
A clastogen is an agent that can induce mutation by disrupting or damaging chromosomes.
Dr. Parry submits second comprehensive report.

Dr. Parry concludes glyphosate is clastogenic.
Specific evaluation of the genotoxicity of glyphosate

On the basis of the study of Lini et al (1998a and 1998b) I conclude that glyphosate is a potential clastogenic \textit{in vitro}. The study of Bolognesi et al (1997) indicates that this clastogenic activity \textit{may} be reproduced \textit{in vivo} in somatic cells. However, the dominant lethal assay (of limited sensitivity) indicates that this genotoxic activity is not reproduced in germ cells. The work of Bolognesi et al (1997) and Lini et al (1998a and 1998b) suggests that the genotoxicity observed may be derived from the generation of oxidative damage in the presence of glyphosate.

Specific evaluation of genotoxicity of glyphosate mixtures

In view of the absence of adequate data no evaluation of the clastogenic potential \textit{in vitro} of glyphosate mixtures is possible. In the absence of a micronucleus study to the protocol of that used by Bolognesi et al (1997) no adequate assessment of the potential activity of glyphosate mixtures in bone marrow is possible. The available studies do not provide any evidence of genotoxicity in rodent bone marrow. There is some evidence from \textit{Drosophila} to suggest that glyphosate mixtures may have some germ cell activity.

The studies of Bolognesi et al (1997) suggests that glyphosate mixtures may be
Dr. Parry submits second report. Dr. Parry concludes glyphosate is clastogenic.

Specific evaluation of genotoxicity of glyphosate mixtures

In view of the absence of adequate data no evaluation of the clastogenic potential in vivo of glyphosate mixtures is possible. In the absence of a micronucleus study to the protocol of that used by Bolognesi et al (1997) no adequate assessment of the potential activity of glyphosate mixtures in bone marrow is possible. The available studies do not provide any evidence of genotoxicity in rodent bone marrow. There is some evidence from Drosophila to suggest that glyphosate mixtures may have some germ cell activity.

The studies of Bolognesi et al (1997) suggests that glyphosate mixtures may be capable of inducing oxidative damage in vivo.

Specific evaluation of surfactants

None of the surfactants were capable of inducing mutations in bacteria. No adequate data available to evaluate the in vivo or in vitro clastogenicity of the surfactants.
Aug 1999

Dr. Parry submits second comprehensive report.

Dr. Parry concludes **glyphosate is clastogenic**.

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**Plaintiff Exhibit 0220**

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**Key Issues concerning the potential genotoxicity of glyphosate, glyphosate formulations and surfactants: recommendations for future work.**

James M. Parry
Centre for Molecular Genetics and Toxicology
School of Biological Sciences
University of Wales Swansea
Swansea SA2 8PP, UK

**Key Questions:**

1. Is glyphosate an in vitro clastogen? Can the positive studies of Loi et al. (1994a, 1998b) be reproduced?
2. Is glyphosate an in vivo clastogen? Can the positive studies of Bolgerini et al. (1997) be reproduced?
3. If glyphosate is an in vivo and in vitro clastogen, what is its mechanism of action and do the mechanisms lead to other types of genotoxic activity in vivo such as point mutation inducers?
4. Does glyphosate produce oxidative damage?
5. Can we explain the reported genotoxic effects of glyphosate on the basis of the induction of oxidative damage?
6. If glyphosate is an in vivo genotoxin is its mechanism of action thresholded? Under what conditions of exposure are the antioxidants defenses of the cell overwhelmed?
7. Are there differences in the genotoxic activities of glyphosate and glyphosate formulations?
8. Do any of the surfactants contribute to the reported genotoxicity of glyphosate formulations?

---

If the genotoxic activity of glyphosate and its formulations is confirmed it would be advisable to determine whether there are exposed individuals and groups within the human population. If such individuals can be identified then the extent of exposure should be determined and their lymphocytes analyzed for the presence of chromosome abnormalities.
Aug 1999

Dr. Parry submits second comprehensive report.

Dr. Parry concludes glyphosate is clastogenic.

4. Does glyphosate produce oxidative damage?

5. Can we explain the reported genotoxic effects of glyphosate on the basis of the induction of oxidative damage?

6. If glyphosate is an in vivo genotoxin is its mechanism of action thresholded? Under what conditions of exposure are the antioxidant defences of the cell overwhelmed?

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8. Do any of the surfactants contribute to the reported genotoxicity of glyphosate formulations?
Aug 1999

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8. Do any of the surfactants contribute to the reported genotoxicity of glyphosate formulations?

If the genotoxic activity of glyphosate and its formulations is confirmed, it would be advisable to determine whether there are exposed individuals and groups within the human population. If such individuals can be identified, then the extent of exposure should be determined and their lymphocytes analysed for presence of chromosome aberrations.
Dr. Parry submits second comprehensive report.

If the genotoxic activity of glyphosate and its formulations is confirmed it would be advisable to determine whether there are exposed individuals and groups within the human population. If such individuals can be identified then the extent of exposure should be determined and their lymphocytes analysed for the presence of chromosome aberrations.
Dr. Parry submits second comprehensive report.

Dr. Parry concludes **glyphosate is clastogenic.**
Aug 1999

Dr. Parry submits second comprehensive report.

Dr. Parry concludes glyphosate is clastogenic.

Sept 1999

Monsanto Reaction: “We simply are not going to do the studies Parry suggests.”

Message

From:  HEYDEN, WILLIAM F [FIND1000] [JO=MONSANTO/CIU=NA-1000 G1/CH=RECIPIENTS/EN=230737]
Sent: 9/7/1999 6:18:16 PM
To:  HIF, LARRY D [FIND1000] [JO=MONSANTO/CIU=GLB-STL/CH=LEGACY ADDRESSES/EN=333322], FARMER, DONNA R [FIND1000] [JO=MONSANTO/CIU=GLB-STL/CH=LEGACY ADDRESSES/EN=330070]
CC:  HEYDEN, WILLIAM F [FIND1000] [JO=MONSANTO/CIU=GLB-STL/CH=LEGACY ADDRESSES/EN=230737]
Subject: RE: Parry report

I have read the report and agree with the comments - there are various things that can be done to improve the report.

However, let’s step back and look at what we are really trying to achieve here. We want to find/develop someone who is comfortable with the genetox profile of glyphosate/formulated and who can be influential with regulators and Scientific Outreach operations when genetox issues arise. My read is that Parry is not currently such a person, and it would take quite some time and $$$ to get him there. We simply aren’t going to do the studies Parry suggests. Do you think Parry can become a strong advocate without doing this work Parry? If not, we should seriously start looking for one or more other individuals to work with. Even if we think we can eventually bring Parry around closer to where we need him, we should be currently looking for a second/back-up genetox supporter. We have not made much progress and are currently very vulnerable in this area. We have time to fix that, but only if we make this a high priority now.

Bill

[Plaintiff Exhibit 0220]

[Plaintiff Exhibit 0221]
All,

I have read the report and agree with the comments - there are various things that can be done to improve the report.

However, let's step back and look at what we are really trying to achieve here. We want to find/develop someone who is comfortable with the genetox profile of glyphosate/Roundup and who can be influential with regulators and Scientific Outreach operations when genetox issues arise. My read is that Parry is not currently such a person, and it would take quite some time and $$$/studies to get him there. **We simply aren't going to do the studies Parry suggests.**

Do you think Parry can become a strong advocate without doing this work Parry? If not, we should seriously start looking for one or more other individuals to work with. Even if we think we can eventually bring Parry around closer to where we need him, we should be currently looking for a second/back-up genetox supporter. We have not made much progress and are currently very vulnerable in this area. We have time to fix that, but only if we make this a high priority now.

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Aug 1999

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Sept 1999

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**Key Issues concerning the potential genotoxicity of glyphosate, glyphosate formulations and surfactants: recommendations for future work.**

James M. Parry

Centre for Molecular Genetics and Toxicology

School of Biological Sciences

University of Wales Swansea

Swansea, SA1 8SF, UK.

**Key Questions:**

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2. Is glyphosate an in vivo clastogen? Can the positive studies of Bolgnetti et al. (1997) be reproduced?

3. If glyphosate is an in vivo and in vivo clastogen, what is its mechanism of action and does the mechanism lead to other types of genotoxic activity in vivo such as point mutation inducers?

4. Does glyphosate produce oxidative damage?

5. Can we explain the reported genotoxic effects of glyphosate on the basis of the induction of oxidative damage?

6. If glyphosate is an in vivo genicin and in mechanism of action has been identified? Under what conditions of exposure are the anticancer activities of the cell overwhelming?

7. Are there differences in the genotoxic activities of glyphosate and glyphosate formulations?

8. Do any of the surfactants contribute to the reported genotoxicity of glyphosate formulations?

---

**Message**

**From:** HEYDEN, WILLIAM F [FIND/1000] [JO=MONSANTO/OU=GLB-STL/OU=LEGACY ADDRESSES/CN=3332] [JO=MONSANTO/OU=GLB-STL/OU=LEGACY ADDRESSES/CN=3330]

**Sent:** 9/17/1999 6:18:15 PM

**To:** HLR, LARRY D [FIND/1000] [JO=MONSANTO/OU=GLB-STL/OU=LEGACY ADDRESSES/CN=3332] [JO=MONSANTO/OU=GLB-STL/OU=LEGACY ADDRESSES/CN=3330]

**CC:** HEYDEN, WILLIAM F [FIND/1000] [JO=MONSANTO/OU=GLB-STL/OU=LEGACY ADDRESSES/CN=3332] [JO=MONSANTO/OU=GLB-STL/OU=LEGACY ADDRESSES/CN=3330]

**Subject:** RE: Parry report

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---
Aug 1999  |  Dr. Parry submits second comprehensive report.

Sept 1999  |  Monsanto Reaction: “We simply are not going to do the studies Parry suggests.”

Admission No. 26
Monsanto admits that it has no record of submitting Dr. Parry’s Reports to the EPA.
Aug 1999

Dr. Parry submits second comprehensive report.

Dr. Parry concludes glyphosate is clastogenic.

Sept 1999

Monsanto Reaction:
“We simply are not going to do the studies Parry suggests.”

Key Issues concerning the potential genotoxicity of glyphosate, glyphosate formulations and surfactants: recommendations for future work.

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Message
From: HEYDEN S W (FND@1000) [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000]
Sent: 9/7/1999 6:18:16 PM
To: HIRF JERRY F [JERRYF@1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000]
CC: HEYDEN S W [FND@1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000] [O/O/1000]
Subject: RE: Parry report

I have read the report and agree with the comments - there are various things that can be done to improve the report.

However, let’s step back and look at what we are really trying to achieve here. We want to find develop someone who is comfortable with the genetox profile of glyphosate/mixed-up and who can be influential with regulators and Scientific Outreach operations when genetox issues arise. My read is that Parry is not currently such a person, and it would take quite some time and $$$ studies to get him there. We simply aren’t going to do the studies Parry suggests. Do you think Parry can become a strong advocate without doing this work Parry? If not, we should seriously start looking for one or more other individuals to work with. Even if we think we can eventually bring Parry around closer to where we need him, we should be currently looking for a second back-up genetox supporter. We have not made much progress and are currently very vulnerable in this area. We have time to fix that, but only if we make this a high priority now.

Bill
Ghostwriting:
Dr. Heydens ghostwrites Williams paper.

From: HEYDEN, WILLIAM F [AG 2000]
To: FARMER, DONNA B [AG 2000]
Subject: RE: IARC Meeting

For the overall plausibility of the paper that we discussed with John (where he gave thebstudie example), I'm still having a little trouble wrapping my mind around that. If we went full-bore involving experts from all major areas (studies, genotoxic, MOA, exposure - not sure who we'd get), we could be pushing $250K or maybe even more. A less expensive/more palatable approach might be to invite experts only for the areas of contention, epidemiology and possibly MOA (depending on what comes out of the IARC meeting), and we could write the Exposure Tox & Genotoxic sections. An option would be to not add [redacted] and have other authors have their names on the publication, but we would be keeping the cost down by doing the writing and they would just edit & sign their names so to speak. Recall that is how we handled Williams, Knox & Murno, 2000.
Ghostwriting:
Dr. Heydens ghostwrites Williams paper.

Ghostwriting:
When a company writes a favorable publication and pays a prestigious author to put their name on it.
Ghostwriting:
Dr. Heydens ghostwrites Williams paper.

Safety Evaluation and Risk Assessment of the Herbicide Roundup and Its Active Ingredient, Glyphosate, for Humans

Gary M. Williams, Robert Kroes, and Ian C. Munro

*Department of Pathology, New York Medical College, Valhalla, New York 10595; †RITOX, Universiteit Utrecht, P.O. Box 80176, NL-3508 TD Utrecht Yaelaan 2, The Netherlands; and ²Cantox Health Sciences International, 2233 Argentia Road, Suite 308, Mississauga, Ontario L5N 2X7, Canada

Received December 6, 1999

From: HEYDEN, WILLY F [A] (A)
Sent: Thursday, March 29, 2007 10:28 AM
To: RAINER, DONNA R [A] (A)
Subject: RE: IAC Review

For the overall plausibility paper that we discussed with John (where he gave the broadsides example) I'm still having a little trouble wrapping my mind around that. If we went full-bore, involving experts from all the major areas (Epi, Toxicogenet, MOA, Exposure - not sure who we'd get), we could be pushing $250K or maybe even more. A less expensive/more palatable approach might be to involve experts only for the areas of contention, epidemiology and possibly MOA (depending on what comes out of the IAC meeting), and we just write the Exposure Toxicogenet sections. An option would be to (and he or she) have their names on the publication, but we would be keeping the cost down by us doing the writing and they would just edit & sign their names on the paper. Recall that is how we handled Williams, Kroes & Munro, 2000.
Ghostwriting:
Dr. Heydens ghostwrites Williams paper.
From: HEYDEN, WILLIAM F [AG/1000]
Sent: Thursday, February 19, 2015 7:53 AM
To: FARMER, DONNA R [AG/1000]
Cc: KOCH, MICHAEL S [AG/1000]; SALTMIRAS, DAVID
Subject: RE: IARC Planning

For the overall plausibility paper that we discussed with John (where he gave the butadiene example), I’m still having a little trouble wrapping my mind around that. If we went full-bore, involving experts from all the major areas (Epi, Tox, Genetox, MOA, Exposure - not sure who we’d get), we could be pushing $250K or maybe even more. **A less expensive/more palatable approach might be to involve experts only for the areas of contention, epidemiology and possibly MOA (depending on what comes out of the IARC meeting), and we ghost-write the Exposure Tox & Genetox sections.** An option would be to add [blurred] and Kier on [blurred] to have their names on the publication, but we would be keeping the cost down by us doing the writing and they would just edit & sign their names so to speak. Recall that is how we handled Williams Kroes & Munro, 2000.
Ghostwriting:
Dr. Heydens ghostwrites Williams paper.
**Ghostwriting:**
Dr. Heydens ghostwrites Williams paper.

**Ghostwriting:**
The Williams paper “has served us well over the last decade.”
Apr 2000

Bill,

Updated and attached for your comment.

Thanks,

David Saltmiras, Ph.D., D.A.B.T.
Toxicology Manager
Regulatory Product Safety Center
Monsanto

Send: Wednesday, December 06, 2010 11:17 AM
To: HEYDENS, WILLIAM F [AG/1000]
Subject: Updated glyphosate activities presentation for Friday's CPTLT meeting
Apr 2000

Ghostwriting:
Dr. Heydens ghostwrites Williams paper.

Apr 2000

Ghostwriting:
The Williams paper “has served us well over the last decade.”
Glyphosate Toxicology Activities
Supporting Registration Reviews

David Saltmirmas, PhD, DABT
CPTLT December 10, 2010
Publications

- Williams et al. (2000) an invaluable asset
  - Monsanto responses to agencies
  - Scientific Affairs rebuttals
  - Regulator reviews

- More current external expert publications are now needed to support our FTO and Registration Reviews
  - EU Annex 1 Renewal requires extensive lit. review
  - Will weight of evidence be measured by number of publications or quality of the science???
Political Science

- Unfortunately, we are facing regulatory reviews with increased focus on
  - Claims in the peer reviewed literature, irrespective of the quality of the science
  - Stakeholder input including activist researchers
  - Political pressure on outcomes - e.g., POEAs in Germany
  - Reduced pesticide use in general
- Williams et al. (2000) has served us well in toxicology over the last decade
- We need a stronger arsenal of robust scientific papers to support the safe use of our products as we face the next set of chemistry registration reviews across the globe

- With increasing business interests in South America, a local network credible expert scientists is crucial to facilitate scientifically robust and objective regulatory evaluations of our products. *We have not determined exactly what we should & could do here. I would modify bullet to reflect that we need to determine an appropriate & do-able (i.e., we can get someone to pay for it) course of action here*
Apr 2000

Ghostwriting:
Dr. Heydens ghostwrites Williams paper.

Apr 2000

Ghostwriting:
The Williams paper “has served us well over the last decade.”
2. Can Roundup cause cancer?

2. Mechanistic Data

Recent Data Findings:

Micronucleus
2. Can Roundup cause cancer?

2. Mechanistic Data

Recent Data Findings: Ghisi (2016)
Does exposure to glyphosate lead to an increase in the micronuclei frequency? A systematic and meta-analytic review

Nédia de Castilhos Ghisi a, b, *, Elton Celton de Oliveira b, Alberto José Prioli b

a Programa de Pós-graduação em Ecologia de Ambientes Aquáticos e Continentais (PEA/Nupélia, Universidade Estadual de Maringá (UEM), Av. Colombo, 5790, Zona 7, 87020-900, Maringá (PR), Brazil

b Universidade Tecnológica Federal do Paraná (UTFPR), Estrada para Boa Esperança, km 4, 85060-000, Dois Vizinhos (PR), Brazil

HIGHLIGHTS

• Systematic meta-analytical review correlating glyphosate exposure and micronuclei.
• Groups exposed to glyphosate formulations have increased formation of micronuclei.
• Significant difference among glyphosate (GLY) and its commercial formulations.
• Difference in MN formation among different exposure routes of GLY.
• Difference in MN formation among different groups of vertebrates.

ARTICLE INFO

Article history
Received 11 March 2015
Received in revised form 6 August 2015
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Handling Editor: Frederic Leusch

ABSTRACT

Glyphosate-based herbicides are among the most used pesticides worldwide. Reviews on the safety of glyphosate have been conducted by several regulatory agencies and research centers, many times with contradictory results. This study is a systematic meta-analytical review of experimental studies on the relationship between exposure to the glyphosate (GLY) and its formulations with the formation of micronuclei (MN) to establish a quantitative estimate of the environmental risks. The natural logarithm (ln) of the estimated response ratio was calculated from 81 experiments. A meta-analysis was performed on the complete data set, and individual meta-analyses were conducted after stratification by test system, class of vertebrates, exposure route, gender, endpoints type of literature, formulation, GLY dose and exposure time. A funnel plot showed an overall positive association between GLY exposure and its for...
Does exposure to glyphosate lead to an increase in the micronuclei frequency? A systematic and meta-analytic review

Nédia de Castilhos de Matos

HIGHLIGHTS

- Systematic meta-analytical approach
- Groups exposed to glyphosate formulations have increased formation of micronuclei
- Significant difference among glyphosate (GLY) and its commercial formulations
- Difference in MN formation among different exposure routes of GLY
- Difference in MN formation among different groups of vertebrates

Meta-analysis:
A statistical approach that combines the results of multiple studies into a single summary estimate.
2. Can Roundup cause cancer?

2. Mechanistic Data

Recent Data Findings: Ghisi (2016)
Can Roundup cause cancer?
2. Can Roundup cause cancer?

Recent Data Findings: Ghisi (2016)
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Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
3. Epidemiology
2. Can Roundup cause cancer?

Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
3. Epidemiology
2. Can Roundup cause cancer?

3. Epidemiology

Epidemiology:
The study of the distribution and causes of disease in human populations.

Non-Hodgkin Lymphoma-specific
2. Can Roundup cause cancer?

3. Epidemiology

Non-Hodgkin Lymphoma:
A cancer that starts in white blood cells called lymphocytes, which are part of the body’s immune system.

Two types:
• B-Cell (most common)
• T-Cell (less common)
2. Can Roundup cause cancer?

3. Epidemiology

Confidence Bound:
A range of values where there is a specified probability that the true value lies within it.
2. Can Roundup cause cancer?

3. Epidemiology

Confidence Bounds

1.5 (0.9-5.0)
2. Can Roundup cause cancer?

3. Epidemiology
2. Can Roundup cause cancer?

3. Epidemiology

NHL – Never / Ever

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NHL – Never / Ever
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3. Epidemiology

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Agricultural Health Study
2. Can Roundup cause cancer?

3. Epidemiology

The Agricultural Health Study

- Large cohort study following pesticide applicators in North Carolina and Iowa
- Does not show any association for general NHL
- Does show association for T-cell NHL
2. Can Roundup cause cancer?

3. Epidemiology

The Agricultural Health Study

- Deeply flawed study
  - Many pesticides being studied
  - Exposure classification
  - Imputation defects
  - AHS failed to detect other known carcinogens
2. Can Roundup cause cancer?

3. Epidemiology

NHL – Exposure Duration

<table>
<thead>
<tr>
<th>Study</th>
<th>RR</th>
<th>Lower</th>
<th>Upper</th>
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<tbody>
<tr>
<td>McDuffie et al. (2001)</td>
<td>1.00</td>
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<td>1.57</td>
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<tr>
<td>&gt;0 and &lt;2 days/year</td>
<td>2.12</td>
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<tr>
<td>&gt;2 days/year</td>
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<tr>
<td>&lt;10 days exposure</td>
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<td>1.04</td>
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<td>&gt;10 days exposure</td>
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<tr>
<td>Andreotti et al. (2018)</td>
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<td>1.18</td>
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<tr>
<td>Q1 intensity</td>
<td>0.83</td>
<td>0.61</td>
<td>1.12</td>
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<tr>
<td>Q2 intensity</td>
<td>0.83</td>
<td>0.65</td>
<td>1.19</td>
</tr>
<tr>
<td>Q3 intensity</td>
<td>0.87</td>
<td>0.64</td>
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</tr>
<tr>
<td>Q4 intensity</td>
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</table>
2. Can Roundup cause cancer?

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<td>4.07</td>
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<td>&gt;10 days exposure</td>
<td>2.26</td>
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Epidemiology:
Hardell study shows 230% increased risk of NHL for glyphosate formulation.
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Monsanto’s Reaction:
Hardell study raises “index of concern.”
Mar 1999

Epidemiology: Hardell study shows 230% increased risk of NHL for glyphosate formulation.

Apr 1999

Monsanto's Reaction: Hardell study raises "index of concern."
In conclusion, the study by Hardell and Eriksson found a modest association between NHL and several chemical pesticides - most notably for MCPA and the collective group of fungicides. The reported weak to moderate associations for glyphosate are not statistically significant and could be due to chance or to recall or confounding bias. It is clear, however, that the widespread use of glyphosate and concerns about pesticide related health effects for farmers and their families will raise the "index of concern" for glyphosate in future agricultural epidemiologic studies.

References


Mar 1999

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Hardell study shows **230% increased** risk of NHL for glyphosate formulation.

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Hardell study raises “index of concern.”

Aug 2001

**Monsanto:**
Dr. Acquavella learns that Dr. Helen McDuffie plans to publish article showing NHL risk with glyphosate.
Additional analyses found significant relationships for more than 2 days use/year for glyphosate (odds ratio 2.1, 95% CI 1.2-3.7) and mecoprop (odds ratio 2.1, 95% CI 1.2-3.6). The full range of confounding factors was not considered in these analyses, but one presumes that again only mecoprop would remain associated with NHL in a multivariate analysis.

Since the organizers of the ISEE meeting asked me to chair the pesticide session which included this paper, I had the opportunity to spend some time with the author. She struck me as a reasonable person. I was expecting a [redacted] but Dr. McDuffee is [redacted]. She doesn’t seem to have any preconceived notions about glyphosate. She agreed to share her paper with me when it is ready for submission for publication. She also agreed to come and present her work to an industry audience (ACPA, us, etc.). I gave her a copy of the Glyphosate review and told her of our Glyphosate Study (FFES). She was extremely grateful and asked to be kept informed of the progress of the study. We obviously need more information before we can make a decision. She also said that she needs for the next few years. The FFES is an equitable sharing of the risks involved in the eventual publication of the work. It remains to be seen whether anyone picks up selectively all the evidence that we have found. The abstract. Obviously, we need to be prepared for more limited information. I mention some specific follow-up plans below.
Mar 1999

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Epidemiology:
McDuffie study shows 212% increased risk of NHL when using Roundup more than 2 days a year.
Epidemiology:
McDuffie study shows 212% increased risk of NHL when using Roundup more than 2 days a year.

Monsanto’s Reaction:
Celebrate the fact that glyphosate is not mentioned in the abstract.
The McDuffee article appeared in the November issue of the journal Cancer Epidemiology, Biomarkers, and Prevention (see abstract below). Unlike the abstract presented at the International Society for Environmental Epidemiology meeting August 1999, Glyphosate is no longer mentioned as a risk factor in the abstract. I'll have to get the article and see what it says in "the small print."

John
John,

I know we don't know yet what is says in the "small print" - but the fact that glyphosate is no longer mentioned in the abstract is a huge step forward - it removes it from being picked up by abstract searches!

Donna

-----Original Message-----
From: ACQUAVELLA, JOHN F [AG/1000]
Sent: Thursday, November 29, 2001 7:54 AM
To: FARMER, DONNA R [AG/1000]
Cc: GOLDSTEIN, DANIELA [AG/1000]; ARMSTRONG, JANICE M [AG/1000]; HEYDENS, WILLIAM F
Subject: the McDuffee article appears - glyphosate not mentioned in the abstract
Importance: High

The McDuffee article appeared in the November journal Cancer Epidemiology, Biomarkers, and Prevention (see
Epidemiology:
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Monsanto’s Reaction:
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Monsanto’s Reaction:
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May 2002

Epidemiology:
Another Hardell study shows 306% increased risk of NHL for Roundup.
Nov 2001

**Epidemiology:**
McDuffie study shows 212% increased risk of NHL when using Roundup more than 2 days a year.

Monsanto’s Reaction:
Celebrate the fact that glyphosate is not mentioned in the abstract.

May 2002

**Epidemiology:**
Another Hardell study shows 306% increased risk of NHL for Roundup.

Mar 2003

**Epidemiology:**
Shows 210% increased risk of NHL for glyphosate formulation. Controlled for 60 other pesticides.
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**Epidemiology:**
Shows 210% increased risk of NHL for glyphosate formulation. Controlled for 60 other pesticides.
Monsanto’s Reaction:
Dr. Acquavella warns that the De Roos study could add fuel to the fire.

Message
From: ACQUAVELLA, JOHN /AGC/VOE000 [AGC-MONSANTO/OU=MA-1000/O=AGC/RECIPIENT/OU=AGC]
Sent: 09/23/2003 2:29 PM
To: CARR, KEVIN; ORGANOX000 [AGC-MONSANTO/OU=MA-1000/O=AGC/RECIPIENT/OU=AGC]; GOLSTEIN, DANIEL
Cc: TROJAN, JEFF [AGC-MONSANTO/OU=MA-1000/O=AGC/RECIPIENT/OU=AGC]; REMPILDE, WILLIAM [AGC-MONSANTO/OU=MA-1000/O=AGC/RECIPIENT/OU=AGC]; [RECIPIENT/OU=AGC]

Subject: [RECIPIENT/OU=AGC] and glyphosate allergy

The authors spent an entire paragraph in the discussion on glyphosate, specifically mentioning the Hardell and McDuffie studies:

I'm afraid this could add more fuel to the fire for Hardell et al.

I'm going to use one of the authors of this paper this weekend at the American College of Epidemiology meeting. I'll ask him about some of these issues.

It looks like NHL and other lymphocytic cancers continue to be the main cancer epidemiology issues both for glyphosate and alfalfa. We're assembling a panel of experts to work on this.

Regards,
John.
The authors spent an entire paragraph in the discussion on glyphosate, specifically mentioning the Hardell and McDuffie studies:

Glyphosate, commercially sold as Roundup, is a commonly used herbicide in the United States, both on crops and non-crop land areas. An association of glyphosate with NHL was observed in another case-control study, but the estimate was based on only four exposed cases. A recent study across large region of Canada found an increased risk of NHL associated with glyphosate use that increased by the number of days used per year. These few suggestive findings provide some impetus for further investigation into the potential health effects of glyphosate, even though one review concluded that the active ingredient is non-carcinogenic and non-genotoxic.

I'm afraid this could add more fuel to the fire for Hardell et al.

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It looks like NHL and other lymphopoietic cancers continue to be the main cancer epidemiology issues both for glyphosate and alachlor. We're assembling a panel of experts to work on this.

Regards,

John
Monsanto’s Reaction:
Dr. Acquavella warns that the De Roos study could add fuel to the fire.
Monsanto’s Reaction:
Dr. Acquavella warns that the De Roos study could add fuel to the fire.

Jan 2005

Epidemiology:
De Roos publishes first iteration of the AHS, showing no association between Roundup and NHL.
Monsanto’s Reaction:
Dr. Acquavella warns that the De Roos study could add fuel to the fire.

Epidemiology:
De Roos publishes first iteration of the AHS, showing no association between Roundup and NHL.
Epidemiology:
Eriksson study shows 202% increased risk of NHL for Roundup. Also shows 236% increased risk of NHL when used for more than 10 days a year.
Epidemiology:
Eriksson study shows **202% increased** risk of NHL for Roundup. Also shows **236% increased** risk of NHL when used for more than 10 days a year.

Monsanto’s Reaction:
“How do we combat this?”
Epidemiology:

Jul 2008

Eriksson study shows 202% increased risk of NHL for Roundup. Also shows 236% increased risk of NHL when used for more than 10 days a year.

Oct 2008

Monsanto's Reaction: "How do we combat this?"

Nassar,

Thank you for forwarding this. We have been aware of this paper for awhile and knew it would only be a matter of time before the activists pick it up. I have some epi experts reviewing it. As soon as I have that review we will pull together a backgrounder to use in response.

Here is their bottom line...how do we combat this?

Avoid carcinogenic herbicides in foods by supporting organic agriculture, and on lawns by using non-toxic land care strategies that rely on soil health, not toxic herbicides.

Regards,

Donna
Epidemiology:
Eriksson study shows 202% increased risk of NHL for Roundup. Also shows 236% increased risk of NHL when used for more than 10 days a year.

Monsanto’s Reaction:
“How do we combat this?”
Epidemiology:
Eriksson study shows **202% increased** risk of NHL for Roundup. Also shows **236% increased** risk of NHL when used for more than 10 days a year.

Oct
2008

Monsanto’s Reaction:
“How do we combat this?”

Apr
2014

Epidemiology:
Schinasi & Leon meta analysis reveals Roundup **increases overall NHL risk by 150%**.
Epidemiology:
Eriksson study shows 202% increased risk of NHL for Roundup. Also shows 236% increased risk of NHL when used for more than 10 days a year.

Monsanto’s Reaction:
“How do we combat this?”

Oct 2008

Epidemiology:
Schinasi & Leon meta analysis reveals Roundup increases overall NHL risk by 150%.
Epidemiology: Monsanto-sponsored meta-analysis shows a 130% increased risk of NHL from Roundup use.
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Oct 2016

Epidemiology: Latest version of the AHS is published using unreliable imputed data. Shows no overall NHL risk.

Nov 2017
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Nov 2017

Discussion

In this updated evaluation of glyphosate use and cancer risk, a large prospective study of pesticide applicators, we observed associations between glyphosate use and overall cancer risk with total lymphohematopoietic cancer, including NHL and multiple myeloma. However, there was some evidence of an increased risk of AML for applicators, particularly in the highest categories of glyphosate exposure compared with never users of glyphosate.

Like other hematological malignancies, AML is thought to result from multiple genetic and environmental factors. Occupational farming and general pesticide exposure have both been linked to leukemia ([13]). In 2007, a meta-analysis of occupational pesticide exposure found a statistically significant increased risk of AML when restricting to cohort studies (meta RR = 1.53, 95% CI 1.02 to 2.34) ([14]), although specific chemicals were not evaluated.

One case-control study that evaluated glyphosate use found evidence of an association with leukemia overall based on ever-exposed cases and did not report results for AML ([15]). Similar to the previous AHS analysis, there was no association with NHL overall based on 32 exposed cases, and AML was not evaluated ([5]). To our knowledge, our study is the first to report a possible association between glyphosate use and AML.

Risk estimates were similar in magnitude between unlagged and lagged exposure analyses for all sites evaluated.
Epidemiology:

Monsanto-sponsored meta-analysis shows a 130% increase in risk of NHL from Roundup use.

Oct 2016

Epidemiology:

Latest version of the AHS is published using unreliable imputed data. Shows no overall NHL risk.

Nov 2017

<table>
<thead>
<tr>
<th>Type</th>
<th>Exposure</th>
<th>OR</th>
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<th>P</th>
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<td>M3</td>
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<td>0.93 to 2.90</td>
<td>.09</td>
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Nov 2017
2. Can Roundup cause cancer?

Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
3. Epidemiology

✓ ✓ ✓
2. Can Roundup cause cancer?
2. Can Roundup cause cancer?

It is my recollection that you notified the EU-GTF of this IARC evaluation, but I am not aware that there has been any talk of approaching the GTF about providing funding to fight this because it is not considered in the remit of achieving Annex Renewal. If so, is this really the case? I thought the EU evaluation could go well into the summer of 2023, and wouldn’t an adverse IARC evaluation have the real potential to impact the results of the Annex Renewal?

I really started thinking about this after our phone call yesterday with the outside epidemiology experts that Donna lined up. The bottom line of the call was that there really is no meaningful publication that we can complete prior to the February submission to positively impact the epidemiology discussion outcome in March. One has to consider that this situational timing did not happen by chance and that more than just pure bad luck is working against glyphosate.

And while we have vulnerability in the area of epidemiology, we also have potential vulnerabilities in the other areas that IARC will consider, namely, exposure, genetics, and mode of action (David has the animal oncogenic studies under control). If there is a force working against glyphosate, there is ample fodder to string together to help the cause even though it is not scientifically justified in its present form. Putting all this in the proper perspective will be quite resource intensive, so can’t we consider approaching the GTF? Recall that the PAG already agreed to fund the oncogenic publication 2+ years ago for this exact reason.

Thanks.

Bill
It is my recollection that you notified the EU-GTF of this IARC evaluation timing issue before the GTF meeting on 10/10 and that you have had any talk of approaching the GTF about providing funding to fight this because at the meeting you are sending Annex I renewal. If so, is this really the case? I thought the EU evaluation of Annex I renewal would take place in May – wouldn’t an adverse IARC evaluation have the real potential to impact the result?

I really started thinking about this after our phone call yesterday with the outside epidemiology experts that Donna lined up. The bottom line of the call was that there really is no meaningful publication that we can complete prior to the February submission to positively impact the epidemiology discussion outcome in March. One has to consider that the situational timing did not happen by chance and that more than just pure bad luck is working against glyphosate.

And while we have vulnerability in the area of epidemiology, we also have potential vulnerabilities in the other areas that IARC will consider, namely, exposure, genetox, and mode of action (David has the animal onco studies under control). If there is a force working against glyphosate, there is ample fodder to string together to help the cause even though it is not scientifically justified in its purest form. Putting all this in the proper perspective will be quite resource
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Thanks.

Bill
2. Can Roundup cause cancer?

- Leading world experts on cancer
- 17 scientists from the EPA, California EPA, and worldwide
- Over six months reviewing all peer-reviewed science on glyphosate
- Held a week-long meeting
- **Unanimous** vote
2. Can Roundup cause cancer?

Participants

• Members:
  ▪ Aaron Blair, National Cancer Institute, USA (Overall Chair)
  ▪ Charles W. Jameson, CWJ Consulting, LLA, USA
  ▪ Matthew T. Martin, U.S. Environmental Protection Agency, USA
  ▪ Lauren Zeise, California Environmental Protection Agency, USA
  ▪ Matthew K. Ross, Mississippi State University, USA

• Invited Specialists
  ▪ Christopher J. Portier, Agency for Toxic Substances and Disease Registry, USA

• Representatives of National and International Health Agencies
  ▪ Jesudoss Rowland, U.S. Environmental Protection Agency, USA

• Observers
  ▪ Thomas Sorahan, for Monsanto Company, USA
  ▪ Patrice Sutton, for the University of California, San Francisco, Program on Reproductive Health and the Environment
Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
   - Sufficient evidence in experimental animals for the carcinogenicity of glyphosate.

2. Mechanistic Data

3. Epidemiology
Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
2. Mechanistic Data
3. Epidemiology

Sufficient evidence of carcinogenicity: The Working Group considers that a causal relationship has been established between the agent and an increased incidence of malignant neoplasms or of an appropriate combination of benign and malignant neoplasms in (a) two or more species of animals or (b) two or more independent studies in one species carried out at different times or in different laboratories or under different protocols. An increased incidence of tumours in both sexes of a single species in a well-conducted study, ideally conducted under Good Laboratory Practices, can also provide sufficient evidence.

GLYPHOSATE

1. Exposure Data
1.1 Identification of the agent
1.1.1 Nomenclature

Chem. Abstract. Serv. Reg. No.: 1071-83-6 (acid); also relevant:

Sufficient: Can Roundup cause cancer?
2. Can Roundup cause cancer?

Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
   - Sufficient

2. Mechanistic Data
   - Strong

3. Epidemiology
   - 

Overall, the mechanistic data provide strong evidence for genotoxicity and oxidative stress. There is evidence that these effects can operate in humans.
Three Pillars of Cancer Science

1. Animal Carcinogenicity Studies
   - Sufficient
2. Mechanistic Data
   - Strong
3. Epidemiology
   - Limited

**Limited evidence of carcinogenicity:** A positive association has been observed between exposure to the agent and cancer for which a causal interpretation is considered by the Working Group to be credible, but chance, bias or confounding could not be ruled out with reasonable confidence.
2. Can Roundup cause cancer?

March 2015: IARC unanimously decides to list glyphosate as a class 2A carcinogen – a probable human carcinogen.
# 2. Can Roundup cause cancer?

## Monsanto’s Response to IARC

<table>
<thead>
<tr>
<th>STRATEGIES/TACTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-IARC</strong></td>
</tr>
<tr>
<td>1. Amplification of Scientific Studies</td>
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<td>- Work with RPSA and Strategic Communications to amplify existing studies and new papers</td>
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<tr>
<td>o Authors work directly with scientific journals to issue alerts and news releases on new bodies of work</td>
</tr>
<tr>
<td>o RPSA posts blog from first-person viewpoint of Monsanto’s David Saltinas, co-author of one of the glyphosate cancer papers</td>
</tr>
<tr>
<td>o Share resources and content with Monsanto key regions to amplify the message globally</td>
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<td>2. Inform / Inoculate / Engage Industry Partners</td>
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<td>- Develop a “toolbox” containing key information and resources</td>
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<td>o Identify key message shortcomings and address through updates to monsanto.com/glyphosate and through US and EU blog posts</td>
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<td>- Work with RPSA, Stakeholder Outreach Team, Industry Affairs, Government Affairs, US Business, Global KS and Regulatory teams, etc. to engage industry partners</td>
</tr>
<tr>
<td>o Tier 1: CropLife International / European Crop Protection Association / GMO Answers / BIO – Identify committees that are next to engage</td>
</tr>
<tr>
<td>o Tier 2: Academics (AgBioChatter), Biofortified, Sense About Science, Genetic Literacy Project, Academics Review</td>
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<td>o Tier 3: Alert food companies via Stakeholder Engagement team (IEF, GMA, CH) for “inoculation strategy” to provide early education on glyphosate residue levels, describe science-based studies versus agenda-driven hypotheses</td>
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<td>o Tier 4: Inoculate key grower associations</td>
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<td><strong>POST-IARC</strong></td>
</tr>
<tr>
<td>4. Orchestrate Outcry with IARC Decision • March 10, 2015</td>
</tr>
<tr>
<td>- Industry conducts robust media / social media outreach on process and outcome</td>
</tr>
<tr>
<td>o Sense About Science? leads industry response and provides platform for IARC observers and industry spokesperson</td>
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<tr>
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<td>o Distribute video and audio responses to IARC decision</td>
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<tr>
<td>o Utilize Monsanto channels (web, FB, Twitter, blog, etc) to provide Monsanto POV</td>
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<tr>
<td>o Corporate Engagement team packages industry and Monsanto responses, then distributes via email to ~20 most influential ag media outlets across print, radio and TV</td>
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<td>5. Engage Regulatory Agencies</td>
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<td>- Grower associations / growers write regulators with an appeal that they remain focused on the science, not the politically charged decision by IARC</td>
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</table>
4. **Orchestrate Outcry with IARC Decision ~ March 10, 2015**
   - Industry conducts robust media/social media outreach on process and outcome
     - [Sense About Science?] leads industry response and provides platform for IARC observers and industry spokesperson
     - CLI and other associations issue press releases
   - Joint Glyphosate Taskforce publishes press release, letter signed by leaders of each manufacturer in North America and Europe
   - Push opinion leader letter to key daily newspaper on day of IARC ruling with assistance of Potomac Group
   - **Monsanto responds with strong reactive statement**
     - Distribute video and audio responses to IARC decision
     - Address media inquiries with company glyphosate spokesperson
     - Utilize Monsanto channels (web, FB, Twitter, blog, etc) to provide Monsanto POV
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5. **Engage Regulatory Agencies**
   - Grower associations/growers write regulators with an appeal that they remain focused on the science, not the politically charged decision by IARC
2. Can Roundup cause cancer?

Monsanto’s Response to IARC

STRATEGIES/TACTICS

PRE-IARC

1. Amplification of Scientific Studies
   - Support the development of three new papers on glyphosate focused on epidemiology and toxicology
   - Work with RPSA and Strategic Communications to amplify existing studies and new papers
     - RPSA posts blog from first-person viewpoint of Monsanto's David Sammons, co-author of one of the
glyphosate cancer papers
     - Share resources and content with Monsanto key regions to amplify the message globally

2. Inform / Inoculate / Engage Industry Partners
   - Develop a “toolkit” containing key information and resources
     - Identify any message shortcomings and address through updates to monsanto.com/glyphosate and
through US and EU blog posts
KS and Regulatory teams, etc. to engage industry partners
     - Tier 1: Crop Life International / European Crop Protection Association / GMO Answers / BIO –
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     - Tier 2: Academics (AgBioChat), Biofortified, Sense About Science, Genetic Literacy Project,
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     - Tier 3: Key food companies via Stakeholder Engagement team (IEC, GMA, CH) for “inoculation
       strategy” to provide early education on glyphosate residue levels, describe science-based studies
       versus agenda-driven hypotheses
     - Tier 4: Inoculate key grower associations

3. Address New Allegations
   - Respond quickly and publicly to new pseudoscience cancer studies
   - Identify / request third-party experts to blog, op-ed, tweet and / or link, repost, retweet, etc.

POST-IARC

4. Orchestrate Outcry with IARC Decision ~ March 10, 2015
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5. Engage Regulatory Agencies
   - Grower associations / growers write regulators with an appeal that they remain focused on the science,
not the politically charged decision by IARC
Nearly 100 scientists from all over the world endorse IARC’s assessment of glyphosate
2.

Can Roundup cause cancer?

Nearly 100 scientists from all over the world endorse IARC's assessment of glyphosate supports that it is a probable cause or not causing cancer.

For Monograph 107, experts evaluated the carcinogenicity of the four insecticides and herbicides, glyphosate. The WG concluded that glyphosate may be classified as a probable carcinogen.

The European Food Safety Authority (EFSA) is the European Union's agency responsible for food safety. EFSA reported on the Renewal Assessment Report of glyphosate that glyphosate is unlikely to pose a hazard to humans and that the data support classification of glyphosate as not a carcinogenic potential. (EFSA, BfR Addendum) EFSA's scientific rationales and the IARC WG conclusions.

Serious flaws in the RAR include the potential for a cancer-causing risk due to exposure to glyphosate. This is the basis for the Agency (EFSA) to conclude that these shortcomings in the RAR are not sufficient to warrant a conclusion. The conclusion of the IARC assessment is based on the data submitted and that the data is not sufficient to conclude that glyphosate is a carcinogen. It is important to note that the data used in the assessment is not sufficient to conclude that glyphosate is a carcinogen.
2. Can Roundup cause cancer?

Nearly 100 scientists from all over the world endorse IARC's assessment of glyphosate as a carcinogenic agent. In the BfR addendum, the EFSA scientific committee suggests similar conclusions. The IARC WG concludes that glyphosate is a possible human carcinogen.

Serious flaws in the RAR include an underestimation of potential for a dose-related increase in exposure to glyphosate. The RAR is based on the basis for the EFSA opinion, and the EFSA concludes that these shortcomings are significant.

THE HUMAN EVIDENCE

EFSA concluded that there is limited evidence for an increased risk of non-Hodgkin lymphoma from exposure to glyphosate-based products. The IARC WG concludes that there is insufficient evidence to classify non-Hodgkin lymphoma as cancer in humans. However, the IARC WG concedes that 'the possibility that it could be carcinogenic in humans cannot be excluded' (p. 351).

The International Agency for Research on Cancer (IARC) categorizes glyphosate as a probable human carcinogen (Group 2A). This means that 'there is limited evidence of carcinogenicity in humans and adequate evidence of carcinogenicity in experimental animals.

The following are authors who endorsed IARC's assessment of glyphosate:


The International Agency for Research on Cancer (IARC) defines a probable human carcinogen as an agent that cause cancer in humans and in experimental animals. This classification is used for agents that are not fully proven to be carcinogenic in humans but that are reasonably certain to be carcinogenic in humans.
Nearly 100 scientists from all over the world endorse IARC’s assessment of glyphosate

The most appropriate and scientifically based evaluation of the cancers reported in humans and laboratory animals as well as supportive mechanistic data is that glyphosate is a probable human carcinogen. On the basis of this conclusion and in the absence of evidence to the contrary, it is reasonable to conclude that glyphosate formulations should also be considered likely human carcinogens.
In most cases, the ACS does not directly evaluate whether a certain substance or exposure causes cancer. Instead, the ACS looks to national and international organizations such as the NTP and IARC, whose mission is to evaluate environmental cancer risks based on evidence from laboratory and human research studies.
2. Can Roundup cause cancer?

Glyphosate v. Roundup

No one tests “Roundup”
2. Can Roundup cause cancer?

Charles Benbrook, PhD.

- B.A. in Economics from Harvard University (1971) and Ph.D. in Agricultural Economics from the University of Wisconsin (1980).
- Former Staff Director of the Subcommittee on Department Operations, Research, and Foreign Agriculture (“DOFRA”) of the House Committee on Agriculture.
- Organized several DOFRA hearings on pesticide issues, and worked with Members of Congress in drafting potential changes in federal laws impacting the Environmental Protection Agency’s (“EPA”) Office of Pesticide Programs (“OPP”).
2. Can Roundup cause cancer?

1. The EPA does not test anything.
2. Vulnerable to political shifts.
3. EPA’s “Scientific Advisory Panel” split.
4. EPA’s Office of Research and Development disagrees.
Opening Statement Roadmap:

1. What is Roundup?
2. Can Roundup cause cancer? **Yes.**
3. Did Roundup cause Mr. Johnson’s cancer?
4. What are Mr. Johnson’s damages?
5. Should Monsanto be punished for its conduct?
Opening Statement Roadmap:

1. What is Roundup?
2. Can Roundup cause cancer? Yes.
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3. Did Roundup cause Mr. Johnson’s cancer?

Chadi Nabhan, M.D.

- Board-Certified hematologist and medical oncologist specializing in Non-Hodgkin Lymphoma (“NHL”).
- Vice President and Chief Medical Officer of Cardinal Health Specialty Solutions.
- Former Medical Director of the Clinical Cancer Center at the University of Chicago.
- Treated thousands of lymphoma patients.
William Sawyer, PhD.

- Ph.D. in toxicology from Indiana University School of Medicine (1983).
- Diplomate of the American Board of Forensic Medicine with more than 28 years of experience in public health and forensic toxicology, including five years of governmental service.
- Former Assistant Professor (23 years) at the Department of Medicine, Upstate Medical University, Syracuse, New York.
- 14 years of experience as a licensed clinical and environmental laboratory director.

3. Did Roundup cause Mr. Johnson’s cancer?
3. Did Roundup cause Mr. Johnson’s cancer?

2012 – New Job at Benicia School District
3. Did Roundup cause Mr. Johnson’s cancer?

Pest Management
3. Did Roundup cause Mr. Johnson’s cancer?

The Label:
3. Did Roundup cause Mr. Johnson’s cancer?

The Label:

Keep out of reach of children.

CAUTION!

CAUSES EYE IRRITATION.
Avoid contact with eyes or clothing.

FIRST AID: Call a poison control center or doctor for treatment advice.

IF IN EYES
- Hold eye open and rinse slowly and gently with water for 15 - 20 minutes.
- Remove contact lenses if present after the first 5 minutes then continue rinsing eye.

- Have the product container or label with you when calling a poison control center or doctor, or going for treatment.
- You may also contact (314) 694-4000, collect day or night, for emergency medical treatment information.
- This product is identified as Ranger PRO® herbicide, EPA Registration No. 524-517.

DOMESTIC ANIMALS: This product is considered to be relatively nontoxic to dogs and other domestic animals; however, ingestion of this product or large amounts of freshly sprayed vegetation may result in temporary gastrointestinal irritation (vomiting, diarrhea, colic, etc.). If such symptoms are observed, provide the animal with plenty of fluids to prevent dehydration. Call a veterinarian if symptoms persist for more than 24 hours.

Personal Protective Equipment (PPE)
Applicators and other handlers must wear: long-sleeved shirt and long pants, shoes plus socks. Follow manufacturer’s instructions for cleaning/maintaining Personal Protective Equipment (PPE). If there are no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

When handlers use closed systems, enclosed cabs or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240 (d) (4-6)), the handler PPE requirements may be reduced or modified as specified in the WPS.
3. Did Roundup cause Mr. Johnson's cancer?

The Label:

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User Safety Recommendations
Users should:
- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
3. Did Roundup cause Mr. Johnson’s cancer?

Admission No. 13
Monsanto admits that it has never warned any consumer that Roundup could cause cancer.

Admission No. 14
Monsanto admits that it has never warned Mr. Johnson that Roundup could cause cancer.
3. Did Roundup cause Mr. Johnson’s cancer?

Personal Protection
3. Did Roundup cause Mr. Johnson’s cancer?

Multiple Heavy Exposures
Nov. 2014: Reports to Monsanto

Message
From: GOLDSTEIN, DANIEL A [AG/1000] [O=MONSANTO/OU=NA-1000-01/CN=RECIPIENTS/CN=527246]
Sent: 11/11/2014 8:19:51 PM
To: BIEHL, PATRICIA M [AG-Contractor/1045] [O=MONSANTO/OU=NA-1000-01/cn=Recipients/cn=208718]
Subject: RE: Ranger Pro Exposure

I will call him. The story is not making any sense to me at all.

Dan

From: BIEHL, PATRICIA M [AG-Contractor/1045]
Sent: Tuesday, November 11, 2014 2:12 PM
To: GOLDSTEIN, DANIEL A [AG/1000]
Subject: Ranger Pro Exposure

Spoke with Dewayne Johnson @ and this is his story.

He told me he works for a school district in CA and about 9 months ago had a hose break on a large tank sprayer. This resulted in him becoming soaked to the skin on his face, neck and head with Ranger Pro. He said he was wearing a white exposure suit and it even went inside that. A few months after this incident he noticed a rash on his knee then on his face and later on the side of his head. He said he changed his laundry detergent, dryer sheets and used all creams available to him but nothing seemed to help. His entire body is covered in this now and doctors are saying it is skin cancer.

He is just trying to find out if it could all be related to such a large exposure to Ranger Pro since he stated his skin was always perfect until this happened. He is looking for answers.

Thanks in advance for your assistance.

Patricia Biehl
Product Support Specialist
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Product Support Specialist
3. Did Roundup cause Mr. Johnson’s cancer?

Multiple Heavy Exposures
Nov. 2014: Reports to Monsanto

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*Patricia Biehl*
Product Support Specialist
3. Did Roundup cause Mr. Johnson’s cancer?

Multiple Heavy Exposures
Mar. 2015: Reports Problem Again

Human Exposure / Adverse Effect Incidents
Involving Monsanto Agricultural Products

Reporting Categories: H-A, H-B, H-C
Reporting Period: March 1, 2015 – March 31, 2015

Substance: Ranger Pro Herbicide from Monsanto

Serial Number: 32283189
Date: 03/27/2015

Medical Outcome: Major Effect H-B

EPA Reg. No.: 524-517

Active Ingredients: Glyphosate 41%

State: California

History and Notes:
Caller states he has been using Ranger Pro as part of his job for 2 to 3 years. He has recently been diagnosed with cutaneous T cell lymphoma. He has concerns about continuing to use Roundup as part of his job and questions if Roundup could be a source of his cancer. As the call progressed, caller said that doctors are unsure as to how to treat his condition and they are not even sure if it is cancer. Caller states that he works with Ranger Pro using a 50 gallon tank and also using a backpack sprayer. He dilutes 10 ounces of the Roundup per gallon (3.0%) for the 50 gallon tank and 4 ounces of Roundup per gallon (1.25%) when using the backpack sprayer. He recalls having been exposed to Roundup twice in the past 2 to 3 years, both from the backpack leaking/malfunctioning. In one case, he was wearing personal protective equipment (PPE) but it soaked through the PPE and his clothing. Recently, he has had a swollen foot and the MD's cannot figure out what is going on. The caller’s level of fear is rising over his continued use of Ranger Pro. He states he continues to get unexplained rashes and nodules over his body. MRPC discussed the product toxicity. The symptoms are not an expected response from the product. Advised MRPC is available, if the treating MD has any questions.
3. Did Roundup cause Mr. Johnson’s cancer?

Good afternoon Matt,

Attached are the FIFRA 6(a)(2) Reports for the Monsanto Lawn & Garden and Monsanto Agricultural products for the month of March 2015.

Please call me at 314-##### if you have any questions.

Thank you,
Joy Thompson RN, CSPI
Industry liaison
Missouri Poison Center
### Human Exposure / Adverse Effect Incidents Involving Monsanto Agricultural Products

**Reporting Categories:** H-A, H-B, H-C  
**Reporting Period:** March 1, 2015 – March 31, 2015

<table>
<thead>
<tr>
<th>Substance:</th>
<th>Ranger Pro Herbicide from Monsanto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number:</td>
<td>32283189</td>
</tr>
<tr>
<td>Date:</td>
<td>03/27/2015</td>
</tr>
<tr>
<td>Medical Outcome:</td>
<td>Major Effect H-B</td>
</tr>
<tr>
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<td>524-517</td>
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<table>
<thead>
<tr>
<th>Date:</th>
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<tbody>
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3. Did Roundup cause Mr. Johnson’s cancer?

Multiple Heavy Exposures
2015: Reports Problem Again

Human Exposure / Adverse Effect Incidents
Involving Monsanto Agricultural Products

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Message:

Good afternoon Matt,

Attached are the FIFRA 6(a)(2)(E) Reports for the Monsanto Lawn & Garden and Monsanto Agricultural products for the month of March 2015.

Please call me at 314-324-3250 if you have any questions.

Thank you,

Joy Thompson RN, CSPI
Industry liaison
Missouri Poison Center
While Mr. Johnson was waiting for a response from Monsanto, he continued to use Roundup and Ranger Pro for another spraying season.

His cancer got worse and worse.

Why?

Roundup can promote cancer.
3. Did Roundup cause Mr. Johnson’s cancer?
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Issues to Consider

1. Exposure
2. Latency
3. Other possible causes
4. Warning

3. Did Roundup cause Mr. Johnson’s cancer?
Opening Statement Roadmap:

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5. Should Monsanto be punished for its conduct?
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Compensatory Damages

- Economic damages
- Non-economic damages
  - physical pain
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Net Worth: $6.6 Billion
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I didn't find anything on the Australian site either ... however take that is taken up it is glyphosate. It stops the synthesis of 3 amino acids (proteins) and this "process" is also found in microbes and fungi.

5. How does Roundup work?
Roundup is taken up through the leaves and moves in the sap flow throughout the plant. It stops the production of proteins so that the plant starves. This process is found only in plants; Roundup has extremely low toxicity to humans and wildlife.

Or this - you cannot say that Roundup does not cause cancer...we have not done carcinogenicity studies with "Roundup".

2. Will Roundup harm my family or me?
Based on the results of short term and long term testing, it can be concluded that Roundup poses no danger to human health when used according to label directions. In long term exposure studies of animals, Roundup did not cause cancer, birth defects or adverse reproductive changes at dose levels far in excess of likely exposure.

I will follow up with the Monsanto folks who interface with Scotts...they are aware that Scotts does these things.

Donna
5. Should Monsanto be punished for its conduct?

1. Why did no one from Monsanto call Mr. Johnson back, even after IARC?

2. Why did Monsanto not send the Perry reports to the EPA and, instead, ghostwrite the Williams paper?

3. Why did Monsanto refuse to study the Roundup formulation, like Dr. Parry suggested 20 years ago?

4. Why did Monsanto feel the need to combat published articles raising concerns about the safety of Roundup?
5. Should Monsanto be punished for its conduct?

Dr. Kirk Azevedo
Sales Representative (former)
5. Should Monsanto be punished for its conduct?

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“We’re about making money, so get it straight.”
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