Glyphosate – time for Stewardship

PSGR

Physicians & Scientists for Global Responsibility

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Jodie Bruning

Bbus.Agribusiness

MA Sociology (res)

Prof David Michaels (OSHA)

‘Our regulatory system is the response to these market failures. The objectives of the laws and the agencies empowered to enforce them is not only to stop the damage and prevent future harm; it is to maintain and strengthen the free market system. Law and regulation are the underpinnings of our economic system.

…Without the regulatory apparatus of the state, our modern economy could not exist.’

EFSA representative uses (2023)

The active substance and the formulation for representative uses

Glyphosate is the ISO common name for *N*-(phosphonomethyl)glycine (IUPAC).

The formulation for representative uses for the evaluation was 'MON 52276', a soluble concentrate (SL) containing 360 g/L of glyphosate as isopropylammonium salt (IUPAC name isopropylammonium *N*-(phosphonomethyl)glycinate) (486 g/L), plus co-formulants.

The representative uses evaluated are:

- pre-sowing, pre-planting and pre-emergence applications by tractor-mounted broadcast spraying in vegetables (root, tuberous, bulb, fruit-vegetable, *Brassica*, leaf and stem) and sugar beet against emerged annual, biennial and perennial weeds;
- post-harvest, pre-sowing and pre-planting applications by tractor-mounted broadcast spraying in vegetables (root, tuberous, bulb, fruit-vegetable, *Brassica*, leaf and stem) and sugar beet against emerged annual, biennial and perennial weeds and cereal volunteers;
- post-emergence of weeds inter-row application by ground-directed, fully shielded (hooded) spraying in vegetables (root, tuberous, bulb, fruit-vegetable, legume and leaf vegetables) against emerged annual, biennial and perennial weeds;
- post-emergence of weeds in-row band application by ground-directed, fully shielded (hooded) spraying in orchards (citrus, stone and pome fruits, kiwi, nut, banana and table olives) and vines (table and wine grape, leaves not intended for human consumption) against emerged annual, biennial and perennial weeds;
- train spray applications directed on railway tracks against emerged annual, biennial and perennial weeds;
- post-emergence-shielded spot treatment spray applications against invasive species (giant hogweed and Japanese knotweed) in agricultural and non-agricultural areas, and against couch grass in vegetables (root, tuberous, bulb, fruit-vegetable, *Brassica*, leaf and stem vegetable) and sugar beet for post-harvest, pre-sowing and pre-planting applications.

Full details of the Good Agricultural Practices (GAPs) can be found in the list of end points in Appendix B.

Data were submitted to conclude that the representative uses of glyphosate proposed at EU level result in a sufficient herbicidal effect following the guidance document SANCO/2012/11251-rev. 4 (European Commission, 2014b).

The information on the active substance, co-formulants and isopropylammonium counter ion declared in the formulation for representative uses has all been considered for the assessments during the peer review.

As regards the literature search carried out by the applicants, there is evidence that the exclusion criteria for relevance of literature used by the applicants at the rapid screening were not properly applied, as also noted by the RMS. Reasons for having excluded several of the ecotoxicology-related publications identified by the literature search at the rapid screening step seemed not pertinent after reading the title and/or abstract. However, where subsequently identified as potentially relevant, these publications were added to the RAR and further assessed. Overall, considering that the public consultation also resulted in available scientific literature being assessed also from a broader time frame than that required by the regulatory framework, EFSA concludes that it is unlikely that relevant evidence from the peer-reviewed scientific literature has been missed by the peer review.

Pre-Harvest Dessication (NZ)

Orion Agriscience Glyphosate 360

‘Broad-acre Crops: Wheat, barley, oats and threshing peas. Can be used to control weeds prior to cultivation or prior to harvest. Spray 7-12 days prior to harvest when the grain moisture is less than 30%. Do not harvest within 7 days after spraying. Do not spray undersown crops. Do not spray crops that will be harvested for seed. For threshing peas: Apply 7-14 days prior to harvest when the pods have dried. Avoid treating plants under drought stress.’

https://www.orionagriscience.co.nz/storage/products/March2021/GLYPHOSATE360_Label.pdf

NZ use patterns

NZ use patterns are far more lax.

Culturally ‘OK’.

- Media barriers to discussing locally.
- Household use: bans in France, Belgium, Netherlands, Germany (end 2025), Austria.
- Public Areas: bans in France, Germany, Bulgaria.
- Nationwide bans: Gulf Cooperation Council. Broader phase-outs.

- Question is – why and how?

Breakdown in stewardship

Farmers/Sprayers 'adrift'

- 'No other choice'.
- Increasing herbicide resistance: wild carrot, ryegrass….
- Tank mixes: Metsulfuron-methyl, adjuvants, etc… FAR advice.
- High concentrations permitted.
- IPM – where is the NZ govt?

MBIE/NZEPA/MPI/ESR

- EPA ignoring broader use permissions in NZ (e.g. EU).
- R/A: Breakdown of good process.
- MPI exclude from 2024 New Zealand Total Diet Study (NZTDS) (Infants and Toddlers)
- MPI – domestic exposures?
- MBIE science policy. No monitoring & no risk assessment.
- MBIE – no pesticide scientists.
- Underfunding NZ EPA.
- Imports – 25th Australian Total Diet Study.

Research failure – can't criticise!

- Late to detect/address resistance.
- Extension services
- Don't talk about data on occupational illness.
- Arable/pasture/horticulture – no central co-ordination for long term research – weed management.
- Lack of vision – robotics/machine learning

Absorption routes

Applicators using hand-held sprayers or backpacks are much more exposed than operators in sealed tractor-cab environments.

Contamination: through overalls, particularly to the chest, forearms and legs. Overalls can wear thin from use leading to more exposure through these pathways, and during disrobing.

Dermal exposures: mobile phone use, from the steering wheel and from pesticide product containers.
Natural face touching, the perioral region, along with hands, increases vulnerability to contamination.
Protective gloves, kept in a public workspace, can be precontaminated by other workers. Reusable gloves can be much more highly contaminated than disposable gloves.

Gillezeau et al 2019. The evidence of human exposure to glyphosate: a review. *Environmental Health* 18:2
Spaan et al 2020. Performance of a Single Layer of Clothing or Gloves to Prevent Dermal Exposure to Pesticides. *Annals of Work Exposures and Health*. 64:3;311-330
Connolly et al 2019. Evaluating Glyphosate Exposure Routes and Their Contribution to Total Body Burden: A Study Among Amenity Horticulturalists. *Annals of Work Exposures and Health*, 2019, Vol. 63, No. 2, 133–147

Absorption routes

Court transcripts (Pilliod trial):
- The skin epidermis acts as a reservoir, holding chemicals, which are then exuded over time, lengthening exposure time.
- Urine testing to predict exposure to farmers excluded the greater quantities in faeces, effectively limiting estimation of farming family exposures.

Upward trends in exposure, the higher body burdens of children, particularly in rural regions, but the paucity of studies to examine glyphosate levels in greater depth. Generally exposed workers in horticulture then transport pesticides to households.

Detections in urine of urban populations – association with pre-harvest desiccation.

Late to ID resistance

- CRI – AgResearch: Zachary Ngow, Trevor James, Christopher Buddenhagen and Deborah Hackell.
- Initial study thought resistance would be in 5% of farms studied – 50% of farms.
- NZ EPA ‘Call for Information’ – ‘Glyphosate helps prevent herbicide resistance’
- NZ EPA – no research. ‘Protection’ but fail to address toxicity of tank mixes.
- PBT – Persistent, Toxic, Bioaccumulative.
- Dermal exposures on applicators are common despite good practice. Persists for far longer than Monsanto had previously divulged.
- More pesticides? Treadmill for farmer health?

NZ EPA

No risk assessment of glyphosate.

- Grandfathered in
- Constant re-evaluations
- Primary deference to

WHO/FAO JMPR endpoints

No residue testing to assess persistence, no testing of exposures in applicators

- Agricultural soil contamination
- Persistence urban environments
- Waterways spraying – persistence in sediment.
- Farmers/applicators – blood/urine levels unknown

Stepped away from monitoring

- Ceased documenting tonnages pesticides in 2008/9.
- Funding for science from 2015 – no avenues for long term research
- NZEPA doesn't feedback from health data/NZ scientists

Occupational Hazards

1

Probably carcinogenic

- NHL, multiple myeloma etc
- 2025 Panzacchi, S., Tibaldi, E., De Angelis, L. et al. Carcinogenic effects of long-term exposure from prenatal life to glyphosate and glyphosate-based herbicides in Sprague–Dawley rats.

2

Organ toxicity

- Hepatotoxicity, Nephrotoxicity, Hemotoxicity, Cardiovascular, and Pulmonary System Intoxication

3

Gut - microbiome

- Digestive/colon cancers
- Long-term association of herbicide use with mental illness.
- ‘shikimate pathway’

4

Chelates minerals

- Reduces bioavailability
- Cofactors in production of proteins & hormones

Mazuryk et al (2024)

- Why is this rule/law important?
- What are the consequences for not following this rule/law.

FAO/WHO JMPR 'Shell Game'

NZEPA – Acceptable Daily Intake drawn from the FAO-WHO JMPR evaluations.

1.0 mg/kg body weight / day.

Glyphosate. Joint FAO-WHO Meeting on Pesticide Residues. Pesticide residues in food – 2004: Part II toxicological evaluations. Report No. WHO/ PCS/06.1.

Pesticide residues in food – 2016: Part II toxicological evaluations / Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group on Pesticide Residues, Geneva

- ADI Unpublished decades old data, undisclosed.
- Applicants send in data but defer to JMPR ADI
- NZ Drinking water standards drawn from this.
- Never evaluate whether this is safe based on a weight of evidence in the scientific literature.

NZ EPA 'Shell Game'

2015 - IARC finding – probably carcinogenic

- Used publicly available data in scientific literature and government white papers.
- IARC Lyon, France. Do not set ADI levels. Cancer risk.

IARC finding – NZ Response?

- 'Review of the Evidence Relating to Glyphosate and Carcinogenicity'
- Relied on industry supplied data to the European consultation. (Public Health Concern. Bruning & Browning)
- Douwes, J., 't Mannetje, A., McLean, D., Pearce, N., Woodward, A., & Potter, J. (2018). Carcinogenicity of glyphosate: why is New Zealand's EPA lost in the weeds? New Zealand Medical Journal, 82-89. NZMJ paper called for the NZEPA review to be 'withdrawn and for the NZEPA to accept IARC's conclusion that glyphosate is a probable carcinogen.'
- NZ EPA ignore – also ignore data disclosures in the discovery process in global court cases.
- Still no risk assessment – committee did not convene. Current High Court Challenge – ELI.

Soil Contamination Limiting bioaccumulation

Glyphosate – adjuvants / co-formulants

- Heavy metals

'we also identified by mass spectrometry the heavy metals arsenic, chromium, cobalt, lead and nickel, which are known to be toxic and endocrine disruptors, as contaminants in 22 pesticides, including 11 G-based ones'

- Petroleum byproducts/ingredients.
- Active (declared) ingredients
- Persistent breakdown metabolites.

Defarge et al 2018. **Toxicity of formulants and heavy metals in glyphosate-based herbicides.** Toxicology Reports, 156-163.

Silva et al 2019. **Pesticide residues in European agricultural soils – A hidden reality unfolded**. Science of The Total Environment. 653:1532-1545

Mesnage, R., & Antoniou, M. (2018). **Ignoring Adjuvant Toxicity Falsifies the Safety Profile of Commercial Pesticides**. Frontiers in Public Health, 361.

Tang & Maggi 2021. **Pesticide mixtures in soil: a global outlook**. Letter. Environ. Res. Lett. 16:044051

Stewardship

1. Ban: retail sales and use in urban environments.
2. Ban: High concentration products, e.g. 600 g/L which increase dermal risk
3. Transition away (ban)– crop desiccation on human food and animal feed.

4. Demand long-term science funding for:
   a. Occupational monitoring and analysis.
   b. Residue and soil contamination.
   c. Integrative pest management – non-chemical weed management.
   d. Robotics/machine learning/ tech development for weed control.
   e. Cropping alternatives that suit NZ conditions in a changing climate.

5. Recognise best practice in Europe – warmer climates versus colder, wetter climates.
   EU decisions also based on preventing groundwater contamination.

6. MPI: failing to monitor is a political decision.

WHOLE OF GOVERNMENT:

Non-chemical weed management: Interdisciplinary scientific approach that will support arable/hort/pasture/viticulture

Centre for Public Health Research (CPHR) Permanent labs for ongoing biomonitoring.

NZ EPA – Risk assessment, inclusive of data in scientific literature.

ESR – detecting classes of pesticides in groundwater – where is the research to understand bioaccumulation and class-based risks?

ACC – analyse and disclose occupational diseases/conditions