Glyphosate – The devil stuff

But what comes next ?

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What can we still eat?

- pesticides,
- food irradiation
- genetically modified foods
- dioxins,
- nitrofen
- acrylamide
- BSE, FMS

How safe are our foods ?

Uncertainty - Mistrust - Confidence decreased

Monsanto: The Green Devil

Monsatan

Glyphosate = Monsanto = Orange A

↓

Genetically modified plants

↓

Risks to environment and life

Simple reflection / calculation:

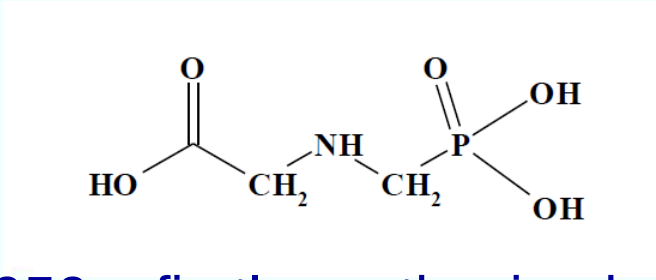
Ban glyphosate – no GMP – no Monsanto

↓

no further risks

A widespread view in Europe

Glyphosate - Introduction



N-(Phosphonomethyl)-glycine

1950 firstly synthesized

1964 patented as chelator (Ca, Mg, Mn, Cu, Zn)

1970 discovered as herbicide

1970 patented by Monsanto as an unselective systemic herbicide

1996 Glyphosate-tolerant soybeans approved in EU

2002 Approval of glyphosate EU

2012 Renewal procedure for glyphosate (BfR, EFSA)

2016 Starting comitology procedure (legislation)

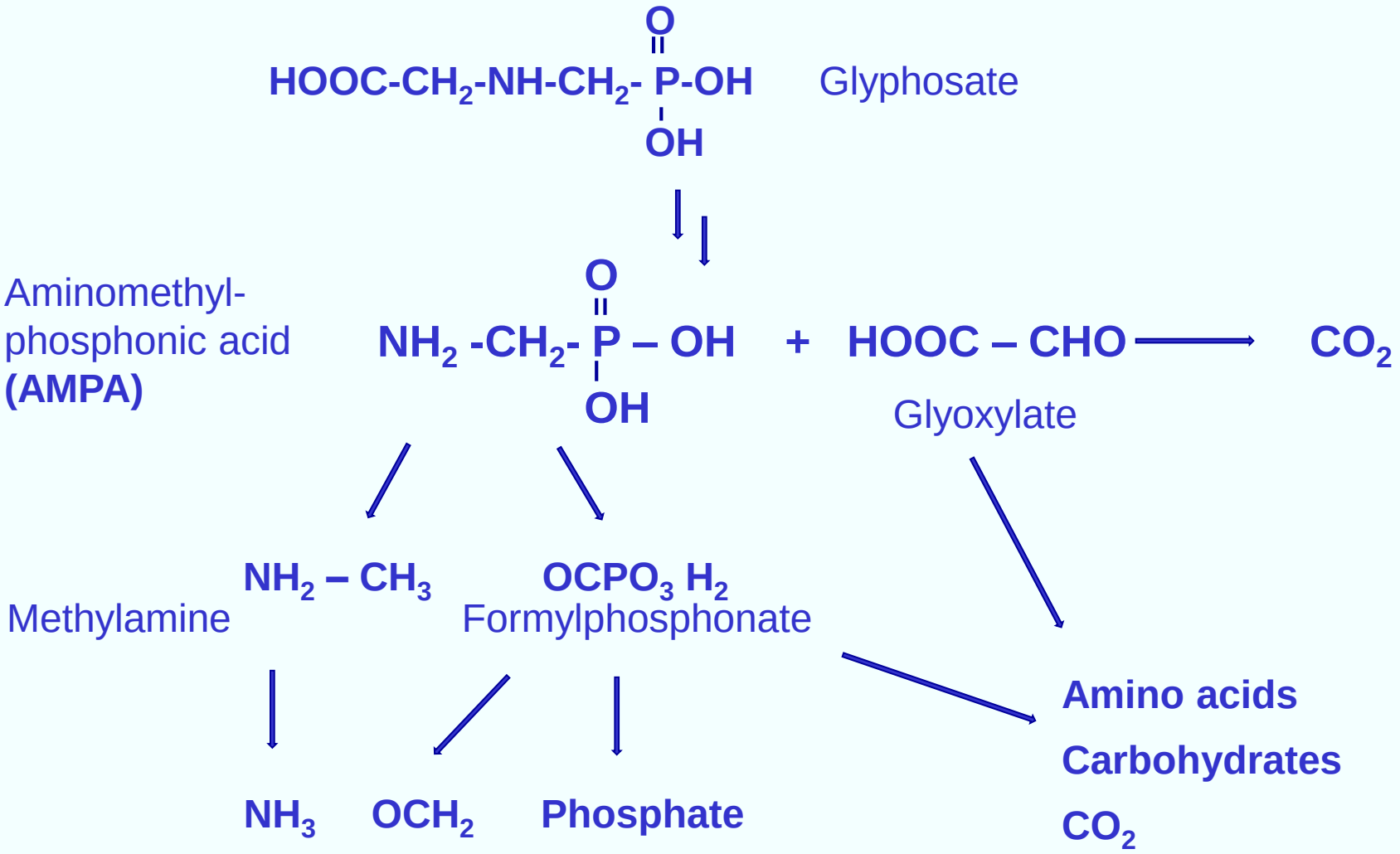
Nov. 26, 2017 New approval for five years

otherwise

Dez. 15, 2017 Approval expires

Glyphosate - Introduction

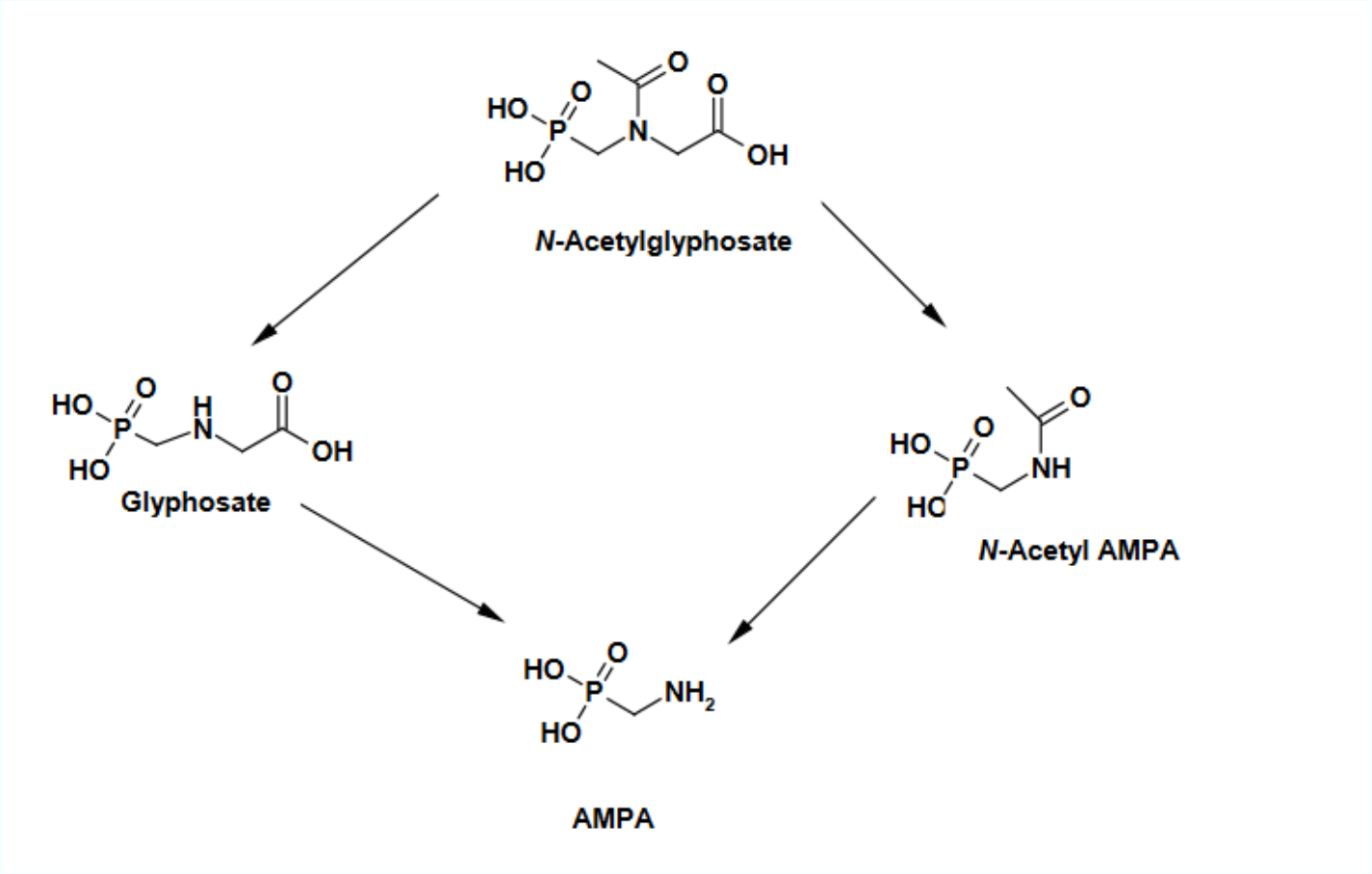
Metabolism: Environment



Schuette J. (1998): Environmental fates of glyphosate

Glyphosate - Introduction

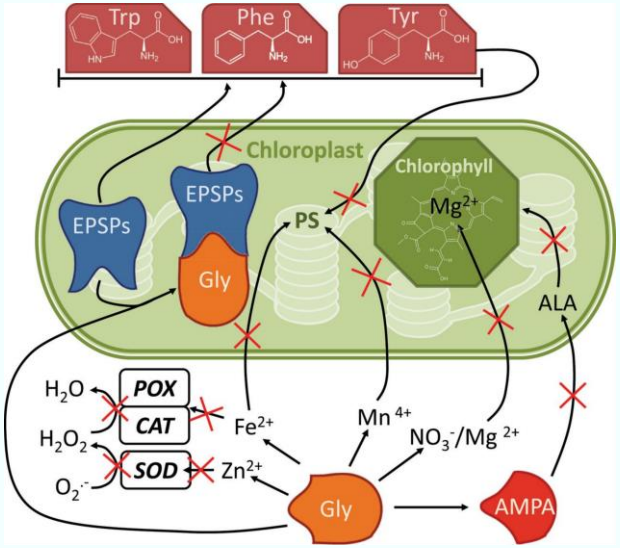
Metabolism: Hens and rodents



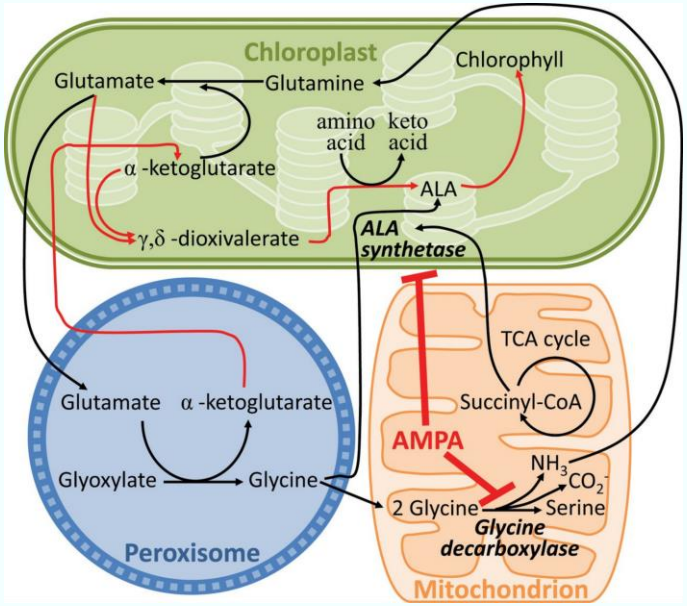
First draft prepared by C.M. Mahieu, B.C. Ossendorp: GLYPHOSATE (158) AND METABOLITES
http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/JMPR/Evaluation11/Glyphosate.pdf

Glyphosate - Introduction

Action:



Chloroplast



Competitive Inhibitor of the enzyme
5-enol-pyruvylshikimate-3-phosphate-synthetase
(EPSP)
Inhibition of the synthesis of aromatic amino acids

Exp Bot. 2014;65(17):4691-4703. doi:10.1093/jxb/eru269

Glyphosate - Introduction

Applications:

Agriculture

- **Weed Control general and special**

  (vine yards, fruit plantations)

- **Field preparation prior to sowing** (pre-sowing)
- **Controlled ripening process**



Glyphosate - Introduction

Applications:

Non – Agriculture area

- industrial area
- railway tracks
- streets, ways, public places
- household and small gardens

DB about 75 tons

Glyphosate is world-wide seen as the most widely used herbicide ingredient.

2014	**Worldwide**	**825800***
	United States	**130000**

Germany

	professional	non-professional use
2012	**5941**	**40**
2013	**4991**	**73**
2014	**5330**	**95**

*tonnes

Glyphosate usage in Germany

Application	% of arable land
stubble field	22,2
pre-sowing	12,7
harvesting	2,2
overall	37,1

Fruit:	
Winter oil seed rape	71,5
Sugar beet	48,4
Winter barely	32,9
Winter wheat	30,9
Maize	27,0
Legumes	26,4

https://www.researchgate.net/publication/307809459_Uses_of_glyphosate_in_German_arable_farming_-_aspects_of_weed_management_and_arable_practice

Which form of agriculture do we want?

Cultivation of wheat

Mono culture

Loss of biodiversity

Climate change

Soybean cultivation

Soybean harvesting

http://en.mercopress.com/2011/09/17/mercosur-consolidates-as-leading-soybean-region-with-52-of-world-s-production

Food safety:

Risk Identification - Risk Assessment

Science
Politics → **Want to have knowledge**

however

Consumers → **Want certainty not knowledge**

Challenge: How to solve the problem ? !

Definition of Risk

Risk of adverse effect = *f* (**Hazard caused by ....** X **Likelihood, Exposure**)

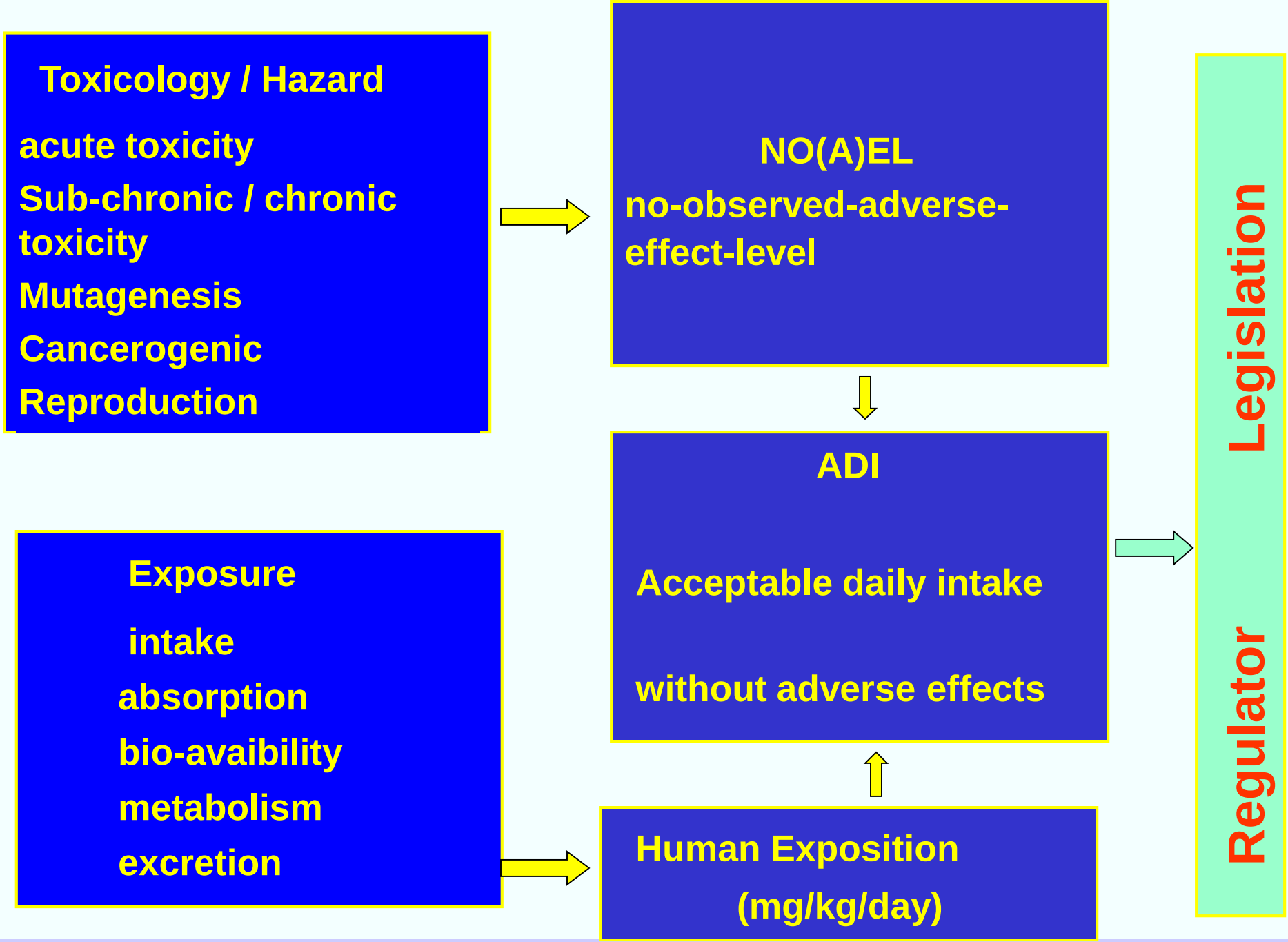
Foods containing

pathogens

mycotoxins

heavy metals

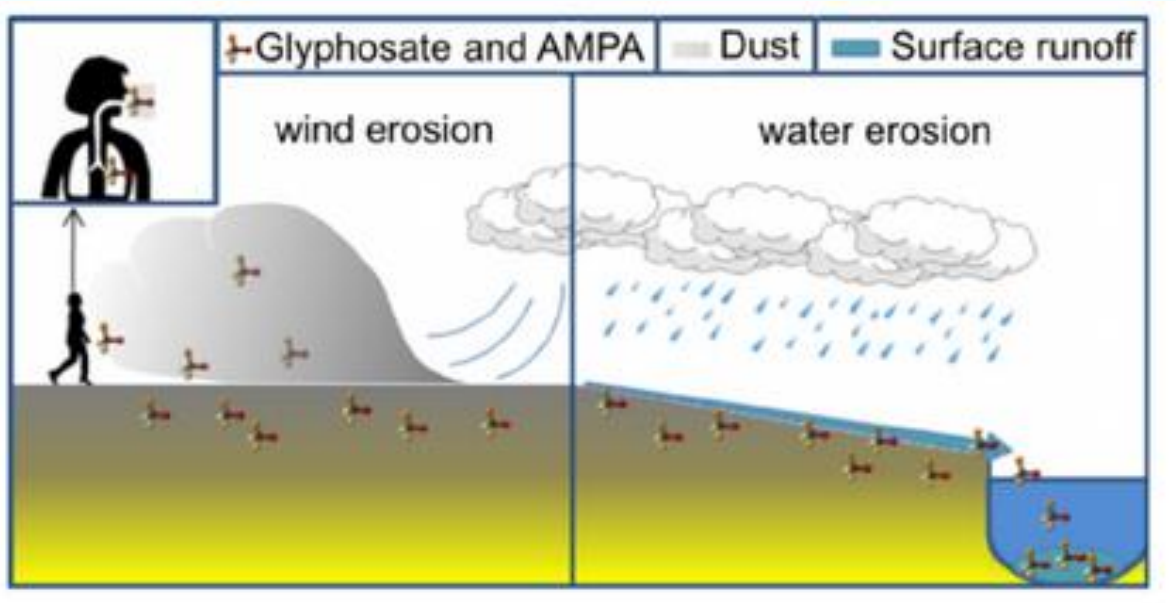
Pesticides


Toxicology / Hazard
acute toxicity
Sub-chronic / chronic toxicity
Mutagenesis
Cancerogenic
Reproduction
NO(A)EL
no-observed-adverse-effect-level
ADI
Acceptable daily intake
without adverse effects
Exposure
intake
absorption
bio-availibility
metabolism
excretion
Human Exposition
(mg/kg/day)
Legislation
Regulator

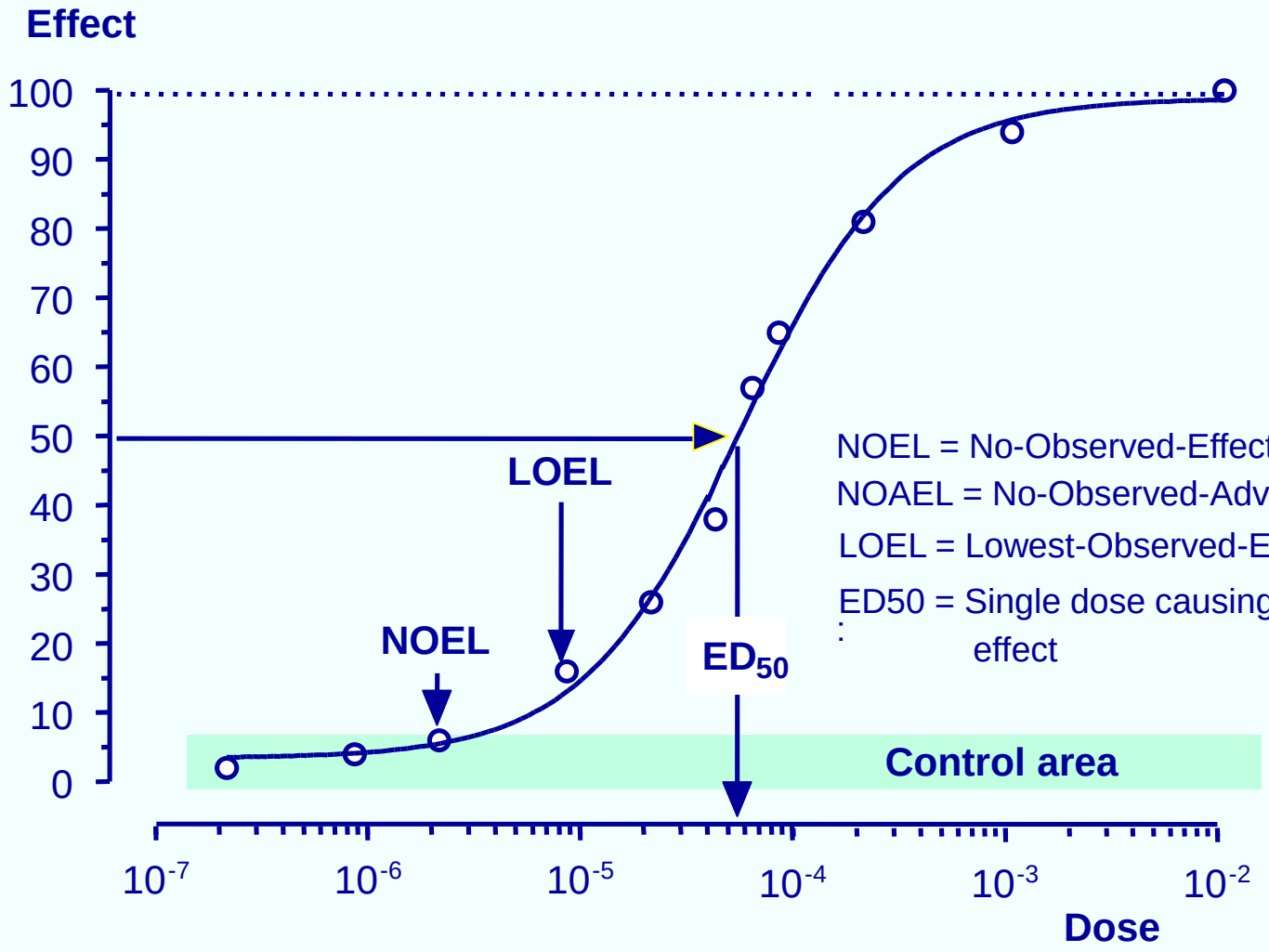
Exposure:

Handling: Skin – Inhalation

Oral route: foods



Dose-Effect Relationship (logarithmic – linear)



NOEL = No-Observed-Effect-Level or
NOAEL = No-Observed-Adverse-Effect-Level

LOEL = Lowest-Observed-Effect-Level

ED50 = Single dose causing 50% of the maximal effect

Toxicity

LD_{50}	mg/kg
Rat (oral)	4320
Duck	4640
Rainbow trout	38
Daphnia	930
Honey bee	0,1 mg/bee

NOEL (rat) 30 mg / kg

ADI-Values

1,75 mg/kg day	EPA 2012
1,00 mg/kg day	IMPR 2016
0,50 mg/kg day	EFSA 2015

MRLs: Maximum Residue Levels

MRL is the highest concentration of an active substance that is legally tolerated in food or feed when pesticides are applied correctly.

	parts per million / mg / kg						
	USA	Codex	EU	Australia	Brazil	Canada	SA
Banana	0,2	0,05	0,1	0,2	0,02		0.1*
Bean, dry	5	2	2	0,1			2**
Sugarcane	2	2	0,1	0,3	1	_	0,5
Pea, dry	8	5	10	5	0,1	3	10*
Maize, grain	5	5	1	1	0,1	3	2
Sunflower seed	85	7	20	0,2			20*
soybean, dry	20	20	20	10	10	20	20**
Wheat, grain	30	30	10	5	0,05	5	30**
Rape seed	20	20	10	20	2	10	20**

Notes: * defers to EU, ** defers to codex

PARACELSUS

**„...Es gibt nichts das nicht Gift ist,
allein die Dosis macht,
dass ein Ding Gift ist...“**

A.Hirschvogel, 1540, Kupferstich, (Albertina, Wien)

Myth ! or ?

Glyphosate is toxic to humans and animals

Wrong:
Hundreds of scientific publications have proven that glyphosate (including its admixtures) have a very low toxicity, classification 1 (coffee, salt, aspirin etc.)

It was concluded that, under present and expected conditions of use, Roundup herbicide *does not pose a health risk to humans*.

Williams Amy Lavin, Watson Rebecca E., & DeSesso John M. (2012). Developmental and Reproductive Outcomes in Humans and Animals After Glyphosate Exposure: A Critical Analysis. *Journal of Toxicology and Environmental Health, Part B, 15(1), pp. 39-96. http://dx.doi.org/10.1080/10937404.2012.632361 AND http://www.ask-force.org/web/HerbizideTol/Williams-DeSesso-Developmental-Glyphosate-2011.pdf AND Correspondence: http://www.ask-force.org/web/HerbizideTol/Williams-Belle-Correspondence-Toxicology-2012.pd*

Beer a very popular and a very traditional drink
“German purity law”

Beer like bread is a critical food that can easily be used to create emotions.

Ingredients:

- Water
- Hops
- barley

Glyphosate 0,3 - 5,1 µ/L

According to the Umweltinstitut München e.V. from 25.02.2016, the German beer is highly contaminated by glyphosate. Of the 14 beers tested, the glyphosate content was 5 to almost 300 times higher than the threshold of drinking water.

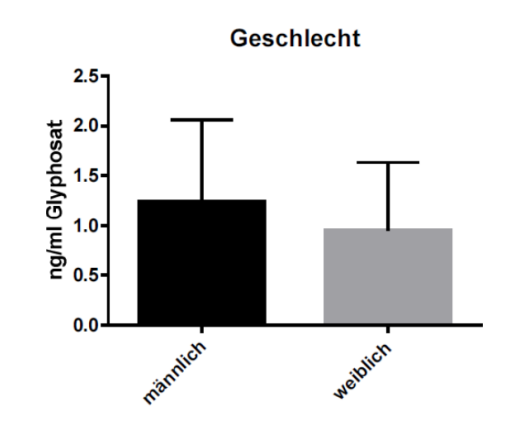
One year later: only 3 to 50 times higher than threshold values of drinking water (0.1 µg/L)

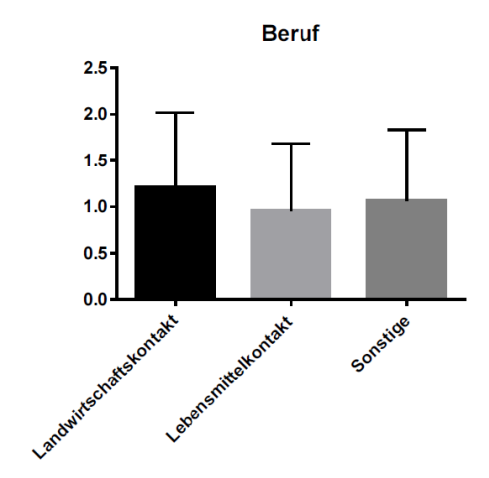
https://www.umweltinstitut.org/fileadmin/Mediapool/Downloads/03_Mitmach

Nachweis von Glyphosat im Urin freiwilliger, selbstzahlender Studienteilnehmer

„Urinale 2015“

Monika Krüger, Andrea Lindner, Johannes Heimrath





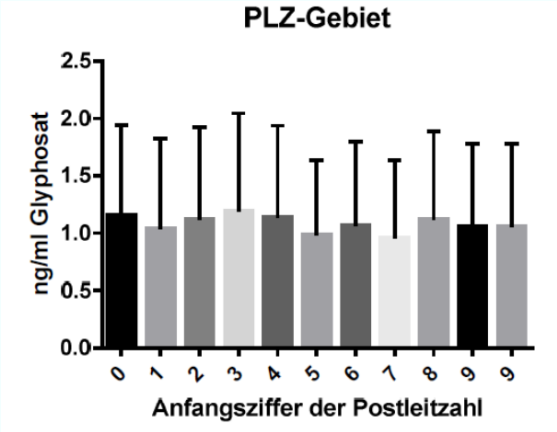


Table 1. Urinary Excretion Levels of Glyphosate and AMPA Among Rancho Bernardo Study Participants Sampled Between 1993 and 2016

	Glyphosate, µg/L			AMPA, µg/L		
	All Participants[a] (N = 100)	Participants Above LOD[b]		All Participants (N = 100)	Participants Above LOD[b]	
Years	Mean (95% CI), µg/L	No. of Participants	Mean (95% CI), µg/L	Mean (95% CI), µg/L	No. of Participants	Mean (95% CI), µg/L
1993-1996	0.024 (0.010-0.039)	12	0.203 (0.151-0.255)	0.008 (0.001-0.016)	5	0.168 (0.114-0.222)
1999-2000	0.053 (0.033-0.074)	30	0.179 (0.136-0.222)	0.044 (0.020-0.069)	15	0.295 (0.205-0.384)
2001-2002	0.110 (0.075-0.146)	43	0.257 (0.197-0.317)	0.112 (0.071-0.154)	43	0.262 (0.185-0.339)
2004-2005	0.111 (0.070-0.152)	38	0.292 (0.213-0.370)	0.091 (0.057-0.124)	40	0.227 (0.164-0.290)
2014-2016	0.314 (0.235-0.394)	70	0.449 (0.352-0.547)	0.285 (0.217-0.352)	71	0.401 (0.319-0.482)

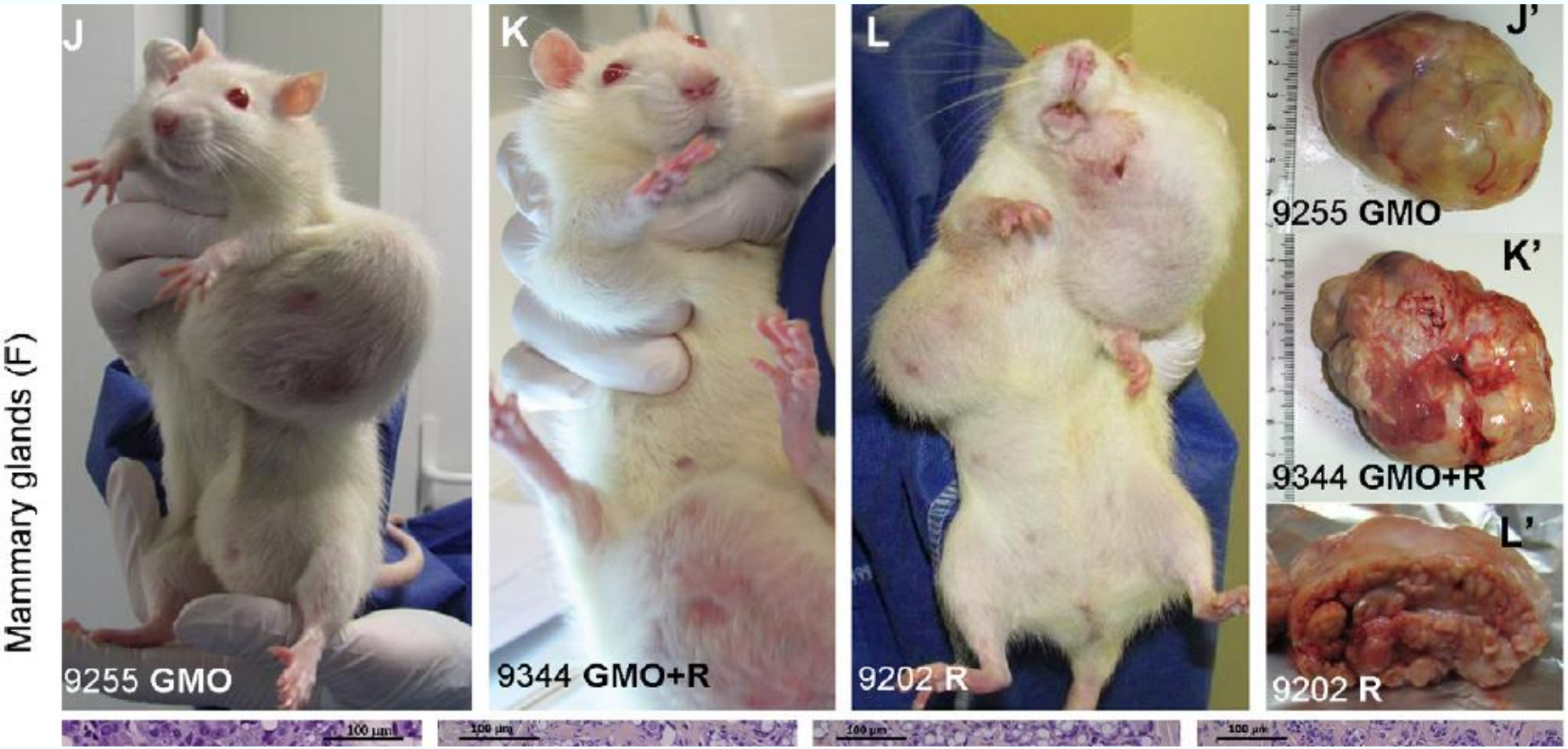
Abbreviations: AMPA, aminomethylphosphonic acid; LOD, limit of detection.

[a] Participants with levels below the LOD had values set at 0.

[b] The LOD was 0.03 µg/L for glyphosate and 0.04 µg/L for AMPA.

Mills P. J. et al. (2017): Excretion of the Herbicide Glyphosate in Older Adults Between 1993 and 2016 JAMA. 2017;318(16):1610-1611. doi:10.1001/jama.2017.11726

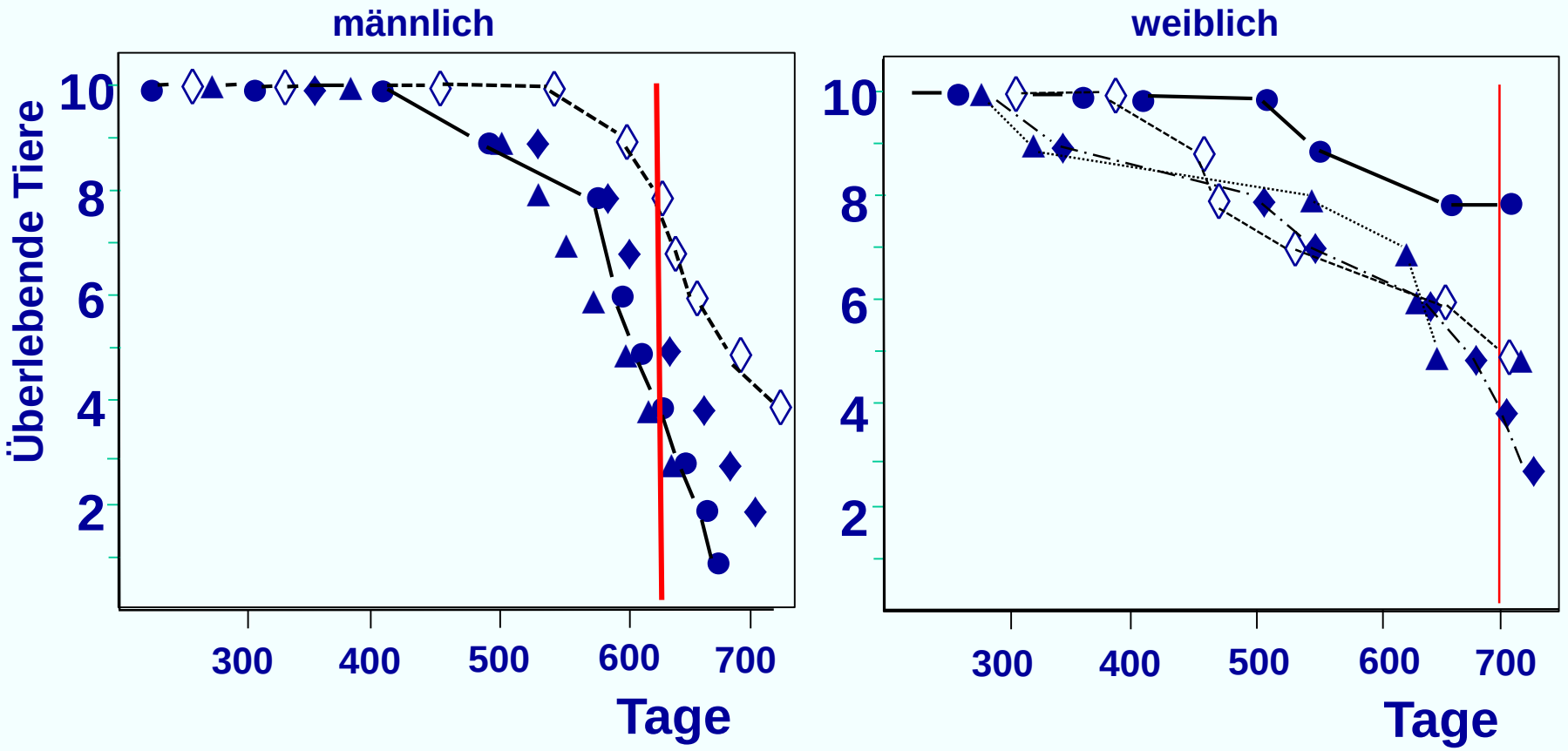
https://jamanetwork.com/journals/jama/article-abstract/2658306



Seralini Gilles-Eric, Emilie Clair, Robin Mesnage, Steeve Gress, Nicolas Defarge, Manuela Malatesta, Didier Hennequin, & Joel Spiroux de Vendomois (2012)
Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize preprint. Food and Chemical Toxicology, ---, ---, pp ---
www.elsevier.com/locate/foodchemtox **AND** http://dx.doi.org/10.1016/j.fct.2012.08.005 **AND** http://www.ask-force.org/web/Seralini/Seralini-Long-Term-Toxicity-RR-2012.pdf **AND**

Jany, K.D.; Widhalm, K. (2013)
Journal für Ernährungsmedizin
15 (1), 8 – 13

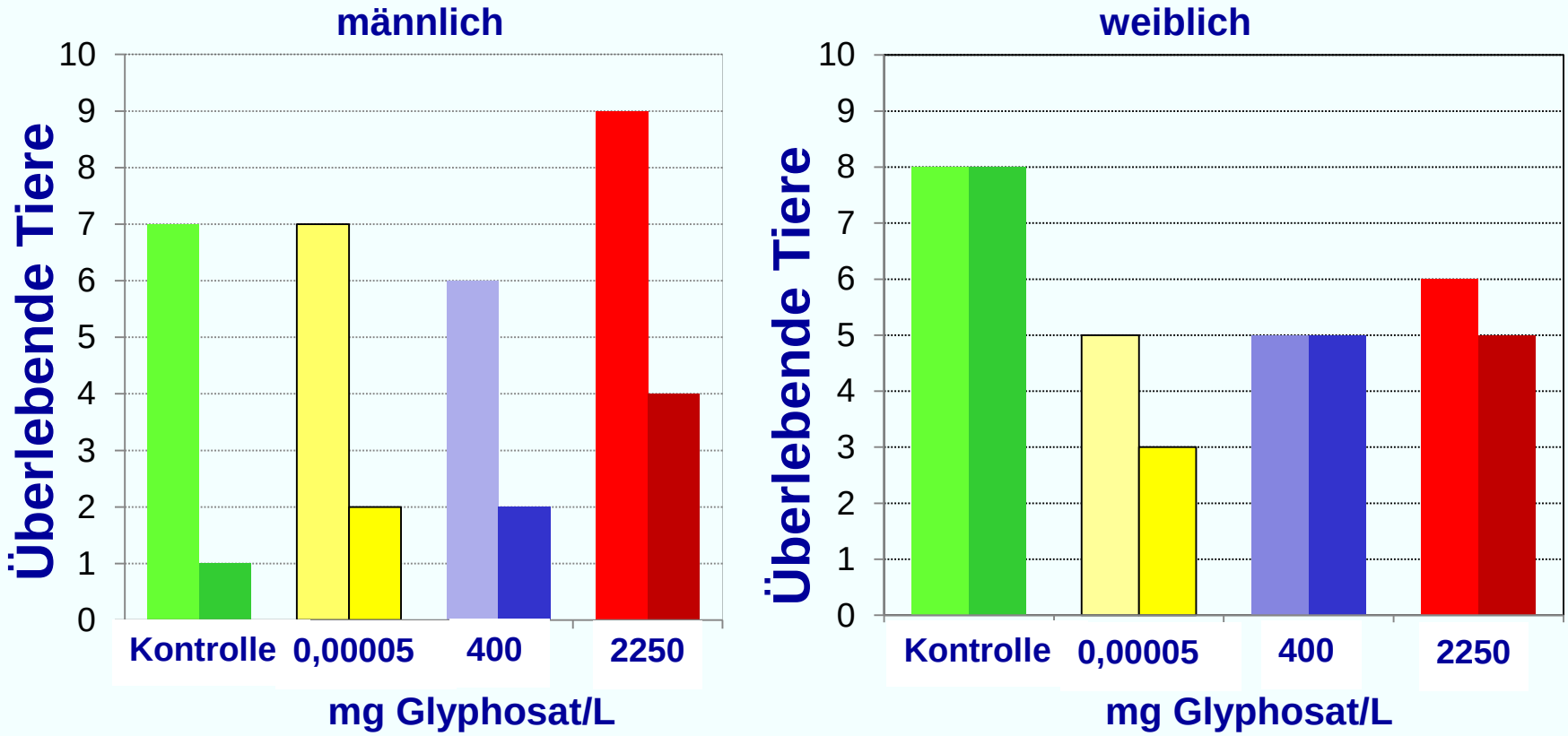
Einfluss von Glyphosat* im Trinkwasser auf die Lebensdauer von Ratten



Glyphosat im Trinkwasser

* „GT Plus“, 450 g/L Glyphosat, „approval 2020448, Monsanto, Belgium“

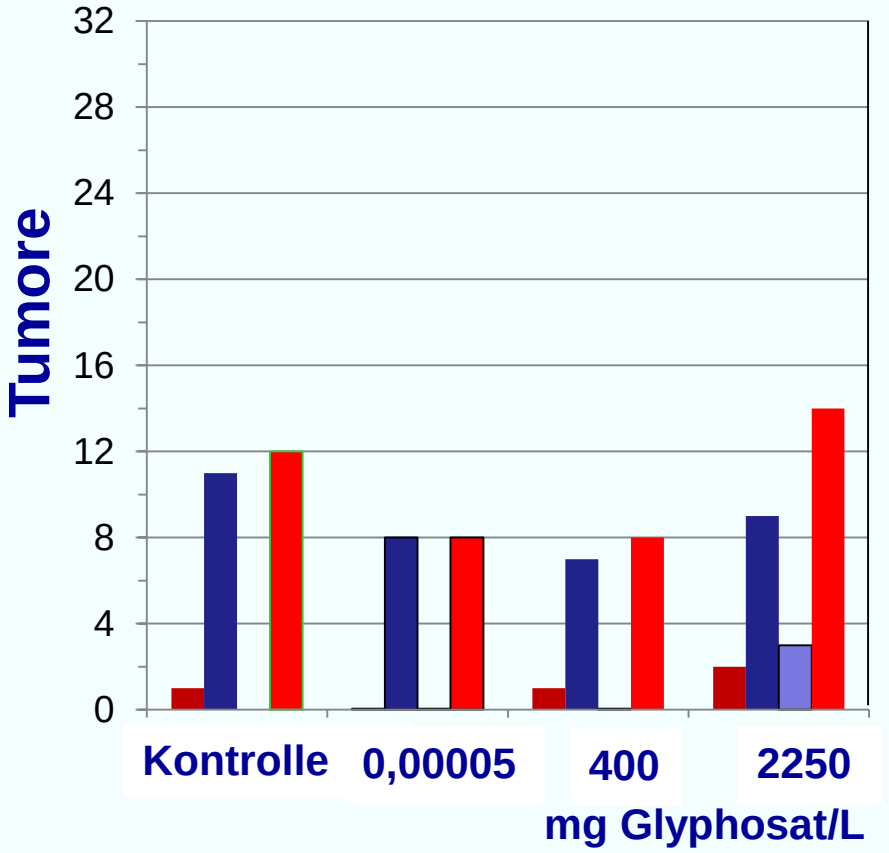
Einfluss von Glyphosat* im Trinkwasser auf die Überlebensrate von Ratten (Sprague-Dawley)

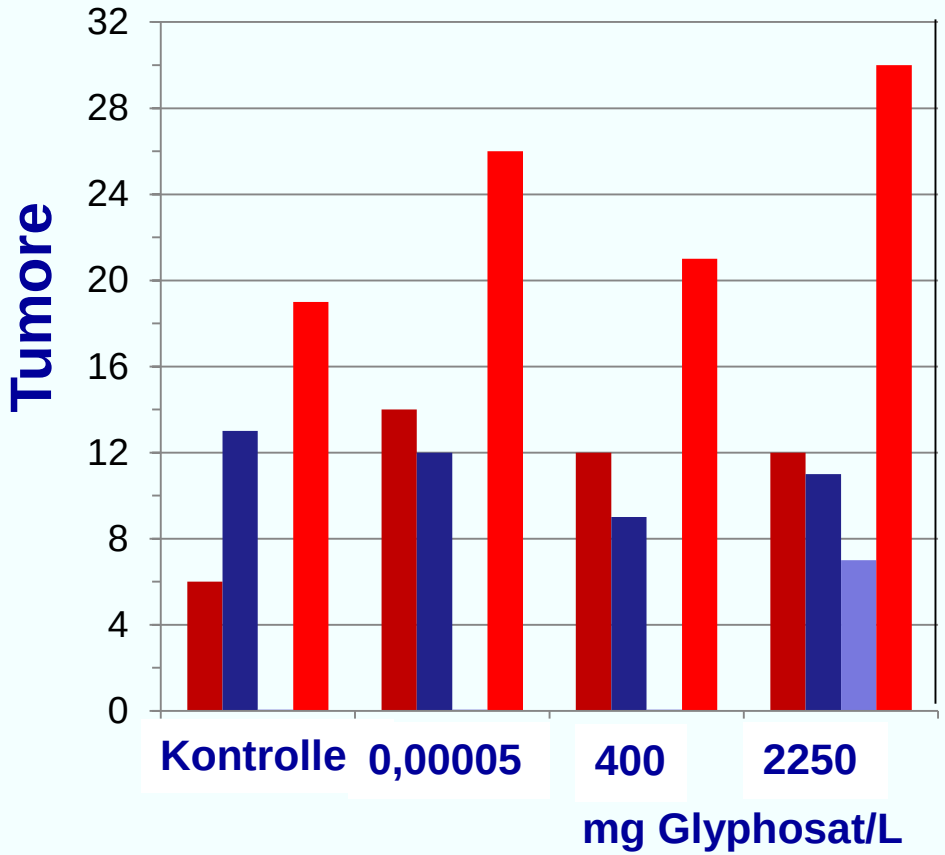


1. Reihe bis zur mittleren Lebensdauer (624 / 701 Tagen)
2. Reihe bis zu Versuchsende

* „GT Plus“, 450 g/L Glyphosat, „approval 2020448, Monsanto, Belgium“

Einfluß von Glyphosat* im Trinkwasser auf die Entstehung von Tumoren





1. Reihe: große Tumore,
2. Reihe: kleine/mittlere Tumore
3. Reihe: Metastasen,
4. Reihe: Gesamtanzahl von Tumoren

False claims:

"Glyphosate's Suppression of Cytochrome P450 Enzymes and Amino Acid Biosynthesis by the Gut Microbiome Consequences are most of the diseases and conditions associated with a Western diet, which include gastrointestinal disorders, obesity, diabetes, heart disease, depression, autism, infertility, cancer and Alzheimer's disease.

The basis for claims of inhibition of CYP enzyme inhibition is tenuous which has been deemed inappropriate for characterizing risk to humans by regulatory authorities. There is a long human and ecological safety record for glyphosate that shows no indication of impact on cytochrome(s) P450 resulting in an adverse effect.

Samsel, A. and S. Seneff (2013), Glyphosate's Suppression of Cytochrome P450 Enzymes and Amino Acid Biosynthesis by the Gut Microbiome: Pathways to Modern Diseases Entropy, 15, 4, pp. 1416-1463,

http://www.mdpi.com/1099-4300/15/4/1416

Reply to the research work of Infascelli and Tudisco

Jany BfR

Tudisco R, Calabro S, Cutrignelli MI, Moniello G, Grossi M, Mastellone V, Lombardi P, Pero ME, and Infascelli F. (2015)

***Genetically modified soybean in a goat diet: influence on kid performance*.**

Small Ruminant Research 126 (Supplement 1), 67-74,

Tudisco R, Mastellone V, Cutrignelli MI, Lombardi P, Bovera F, Mirabella N, Piccolo G, Calabro S, Avallone , and Infascelli, F. (2010)

Fate of transgenic DNA and evaluation of metabolic effects in goats fed genetically modified soybean and in their offspring

Animal 4,1662-71

R. Tudisco, P. Lombardi, F. Bovera, D. d'Angelo, M. I. Cutrignelli, V. Mastellone, V. Terzi, L. Avallone and F. Infascelli (2006)
Genetically modified soya bean in rabbit feeding: detection of DNA fragments and evaluation of metabolic effects by enzymatic analysis
Animal Science 82: 193–199

Mastellone V, Tudisco R, Monastra G, Pero M. Calabro S, Lombardi P, Grossi M, Cutrignelli M, Avallone L, and Infascelli F. (2013)
Gamma-glutamyl transferase activity in kids born from goats fed genetically modified soybean.
Food and Nutrition Sciences: 4, 50-54,

Tudisco, R.; Cutrignelli, M.I.; Calabro`,S.; Cuglielmelli, A.; Infascelli, F. (2007)
Investigation on genetically modified soybean (RoundUp Ready) in goat nutrition: DNA detection in suckling kids.
Ital. J. Anim.Sci. 6 (Suppl. 1), 380-382

Figure 1 Tudisco et al. 2010

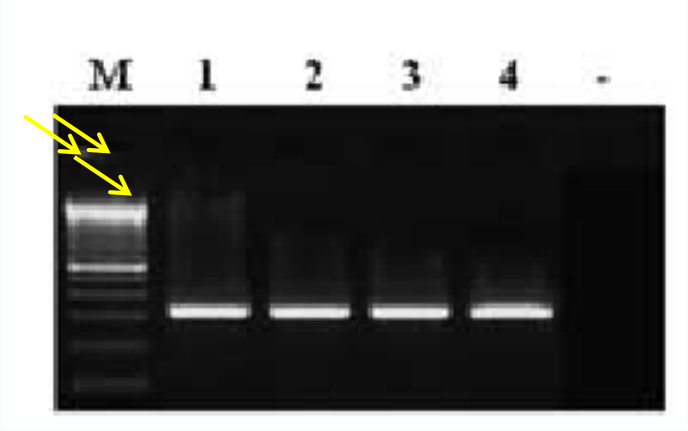


Figure 1 Representative electrophoresis gels of amplified DNA in: (left) milk and blood from control (lines 1 and 3) and treated (lines 2 and 4) goats; (right) liver, kidney, skeletal muscle, spleen, heart and blood from control (lines 1 to 6, respectively) and treated (lines 7 to 12, respectively) kids. In each panel, lane M contains a 100 bp DNA ladder; '2' is a negative control (no DNA template).

Fig 1 of Tudisco et al 2010 becomes
Fig 1 of Tudisco et al 2015

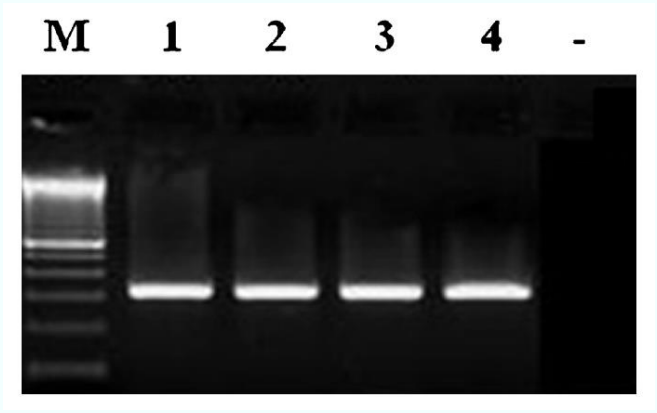
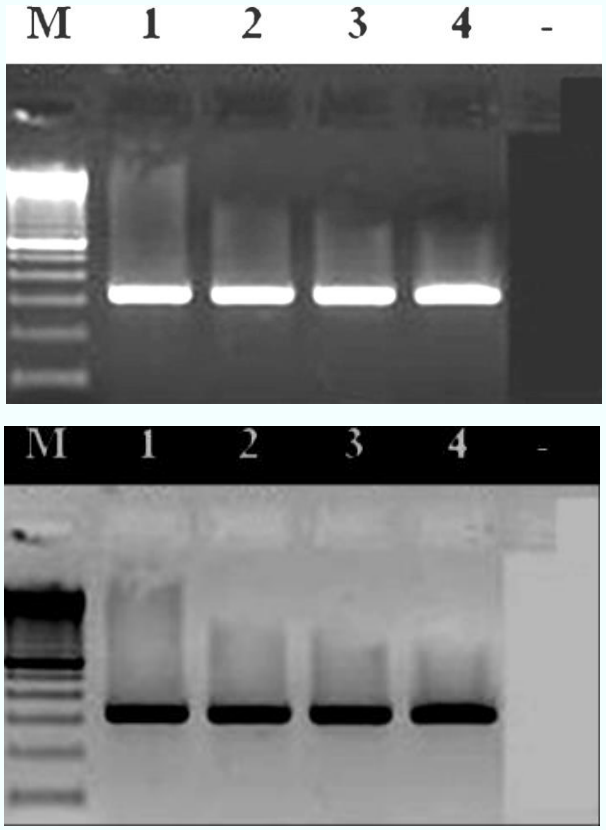


Fig. 1. Representative electrophoresis gels of amplified DNA in colostrum from C13 and C20 (lines 1 and 2, respectively) and T13 and T20 (lines 3 and 4, respectively) goats. Lane M contains a 100 bp DNA ladder; '−' is a negative control (no DNA template).

Figure 1 Tudisco et al. 2015



Increasing the brightness (top) and inverting the colors (bottom) reveal image manipulation.

Figure 4 Tudisco et al 2010

Brightened for clarity; last 5 lanes cropped away

Figure 4 Representative data of amplified transgenic DNA fragments. < > (b) 35S promoter fragments (195 bp) in liver, kidney, spleen, heart, skeletal muscle and blood from control (lines 7 to 12, respectively) and treated (lines 1 to 6, respectively) kids <> In each panel, lane M contains a 100-bp DNA ladder, '2' is a negative control (no DNA template), and '1' is a positive control (DNA extracted from Roundup Ready soybean meal).

Fig 4 of Tudisco et al 2010 becomes Fig 1 of Mastellone et al 2013. However, the upper band for lane 6 has disappeared.

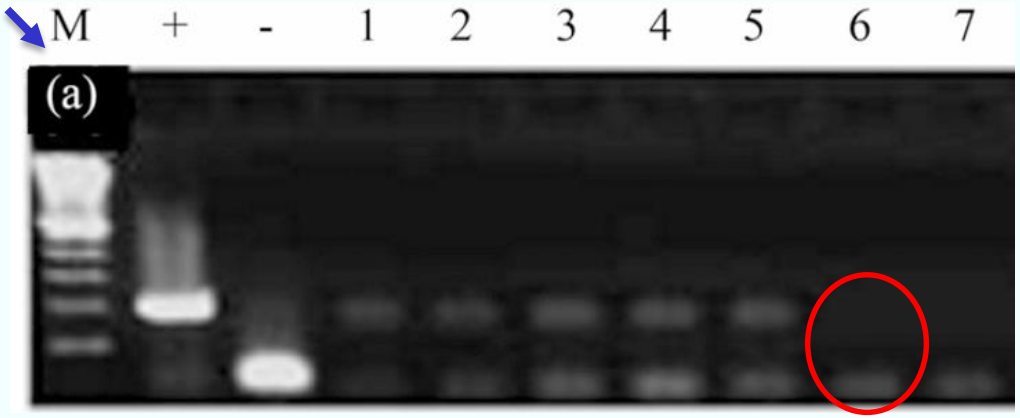


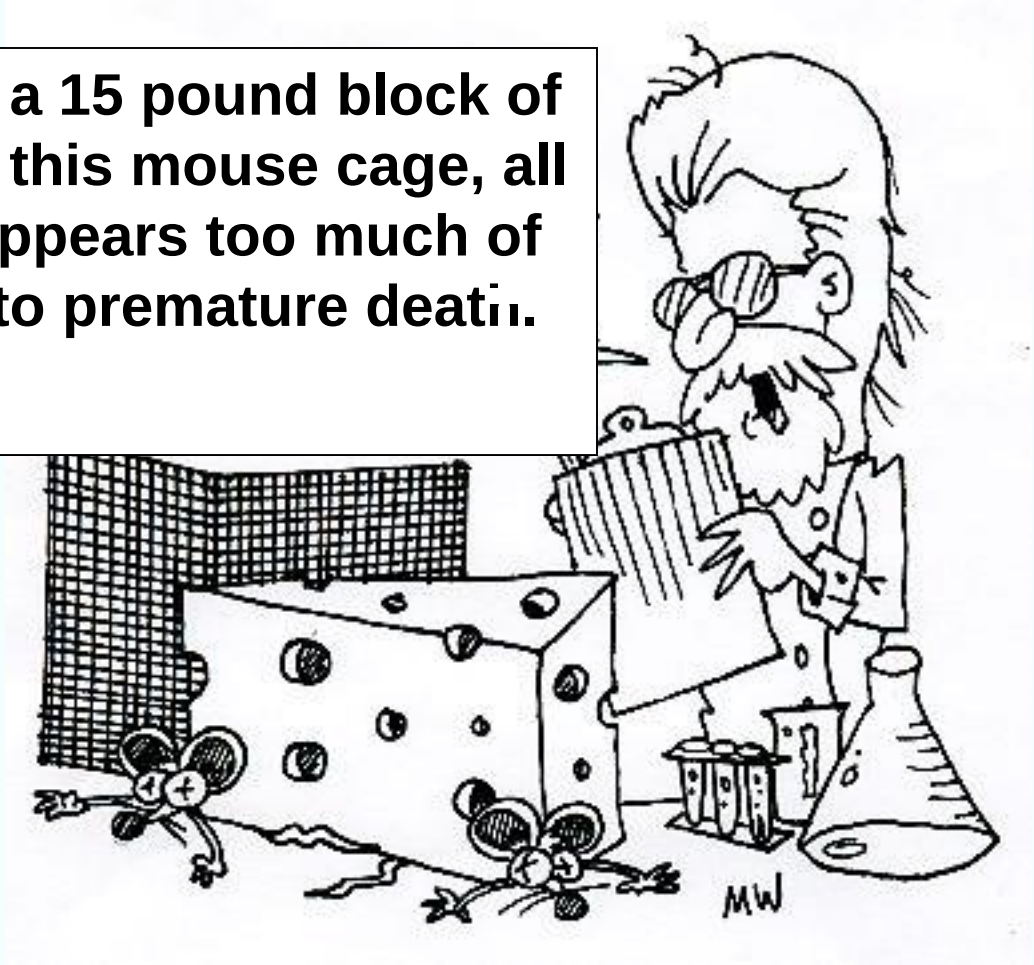
Figure 1
Mastellone et al 2013

Brightened for clarity; last 3 lanes cropped away

Interpreting Scientific Results

The devil is in the details

When we dropped a 15 pound block of Swiss cheese into this mouse cage, all the mice died. It appears too much of this cheese leads to premature death.



Glyphosate and its metabolite AMPA were tested in 317 EU agricultural topsoils.

21% of the tested EU topsoils contained glyphosate, and 42% contained AMPA.

Both glyphosate and AMPA had a maximum concentration in soil of 2 mg kg^{-1}.

Some contaminated soils are in areas highly susceptible to water and wind erosion.

Sila V. et al. (2018): Distribution of glyphosate and aminomethylphosphonic acid (AMPA) in agricultural topsoils of the European Union. Science of The Total Environment 621, 1352-1359

https://www.sciencedirect.com/science/article/pii/S0048969717327973

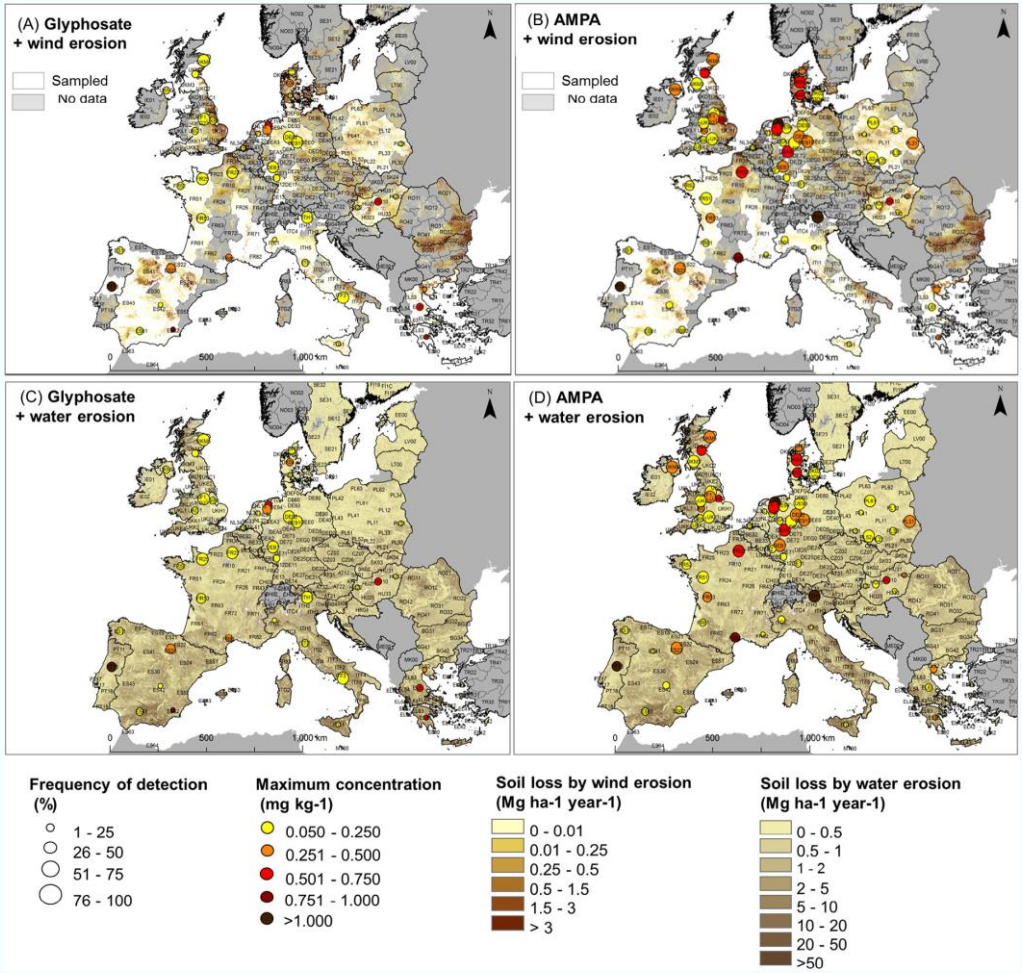


Fig. 2. Frequency of detection of glyphosate and AMPA (≥ 0.05 mg kg^{-1}) and respective maximum concentrations (mg kg^{-1}) in EU agricultural topsoils (0–15/20 cm) by NUTS 2 region, imposed on maps of soil loss by wind [Panel A (glyphosate)/Panel B (AMPA)] and water [Panel C (glyphosate)/Panel D (AMPA)] erosion (Mg ha^{-1} $year^{-1}$). Circles in a NUTS 2 region indicate at least one soil sample containing glyphosate or AMPA (≥ 0.05 mg kg^{-1}).

Message:

Glyphosate is everywhere. The world's most widely sold pesticide is present in farmland, fields and rivers. We eat it in bread, drink it in beer and carry it in our bodies. Glyphosate must be toxic.

The authorities responsible for its approval have to react

Ban on glyphosate worldwide !

Renewal procedure for glyphosate

Assessment* by BfR, EFSA, ECCA, WHO/JMPR

“Not likely to be carcinogenic to humans”

* About 3500 papers evaluated and assessed

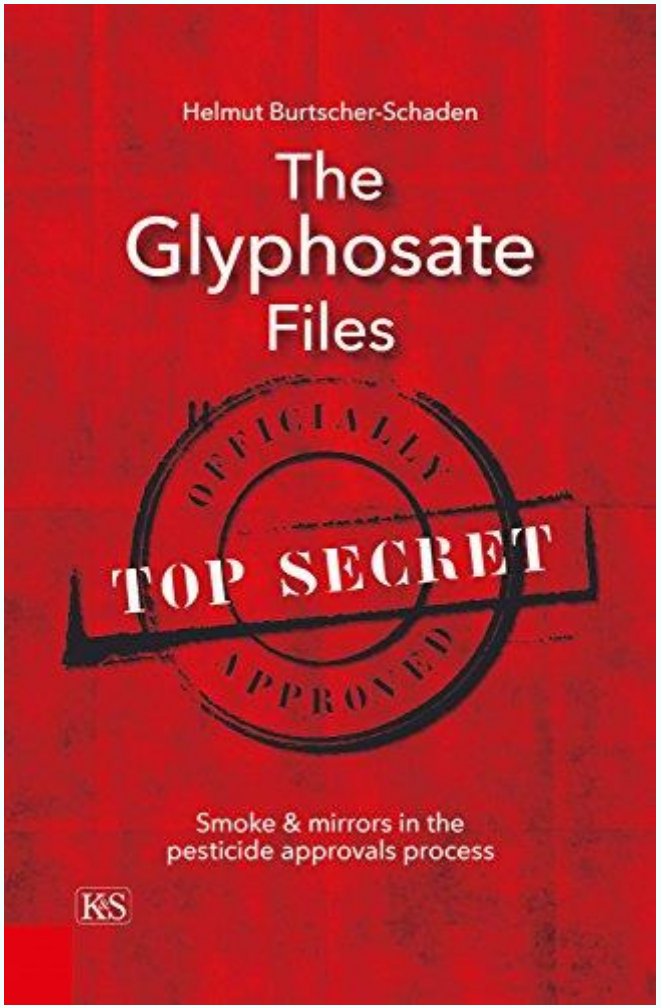
March 20, 2015 IARC classifies glyphosate as "probably carcinogenic to humans"

	Activity (current status)	Evidence in humans (cancer sites)	Evidence in animals	Mechanistic evidence	Classification*
Tetrachlorvinphos	Insecticide (restricted in the EU and for most uses in the USA)	Inadequate	Sufficient	..	2B
Parathion	Insecticide (restricted in the USA and EU)	Inadequate	Sufficient	..	2B
Malathion	Insecticide (currently used; high production volume chemical)	Limited (non-Hodgkin lymphoma, prostate)	Sufficient	Genotoxicity, oxidative stress, inflammation, receptor-mediated effects, and cell proliferation or death	2A†
Diazinon	Insecticide (restricted in the USA and EU)	Limited (non-Hodgkin lymphoma, leukaemia, lung)	Limited	Genotoxicity and oxidative stress	2A†
Glyphosate	Herbicide (currently used; highest global production volume herbicide)	Limited (non-Hodgkin lymphoma)	Sufficient	Genotoxicity and oxidative stress	2A†

EU=European Union. *See the International Agency for Research on Cancer (IARC) preamble for explanation of classification system (amended January, 2006). †The 2A classification of diazinon was based on limited evidence of carcinogenicity in humans and experimental animals, and strong mechanistic evidence; for malathion and glyphosate, the mechanistic evidence provided independent support of the 2A classification based on evidence of carcinogenicity in humans and experimental animals.

***Table:* IARC classification of some organophosphate pesticides**

Trawling for cancer victims.



In the fine print: If No Recovery, No Fees or Costs are Charged!

There is no new research or data presented.
Each of the studies considered by IARC have been previously reviewed and considered by regulatory agencies – most recently by the German government on behalf of the European Union. (1)

Relevant, scientific data was excluded from review.
IARC received and purposefully disregarded dozens of scientific studies specifically genetic toxicity studies – that support the conclusion glyphosate is not a human health risk.

IARCs classification is not supported by scientific data.

(1) BfR. (20150323). Does glyphosate cause cancer? pp. 2 Berlin: BfU ISBN/ISSN BrR, Bundesinstitut für Risikobwertung
Retrieved from http://www.bfr.bund.de/cm/349/does-glyphosate-cause-cancer.pdf AND http://www.ask-force.org/web/HerbizideTol/BfR-Does-glyphosate-cause-cancer-20150323.pdf

MONSANTO HAS INFLUENCE OVER EUROPEAN REGULATORS

- German BfR prepares evaluation of glyphosate relying on industry's Glyphosate Task Force
- EFSA follows BfR lead, basing a recommendation on glyphosate safety on copied and pasted analyses from a Monsanto study.
- EFSA follows guidance of EPA official Jess Rowland in disregarding 2001 study showing link between glyphosate exposure and mouse tumors. Rowland shown to have close ties to Monsanto in documents and now part of OIG probe into agency collusion with company.
- Joint FAO/WHO Meeting on Pesticide Residues (JMPR) that disagreed with IARC included several scientists who were members of, or worked for, chemical industry interests. An institute co-run by the chairman of JMPR received a six-figure donation from Monsanto. Co-chair was board member of same organization receiving Monsanto funds.

New committee to scrutinise conflicts of interest in glyphosate approval process

The European Parliament has set up a special committee to investigate the EU´s approval process for pesticides.

“The Parliament has raised serious concerns about the application of the approval criteria and the non-application of the precautionary principle. We are concerned about possible conflict of interest at all levels in the approval process.”

“Our main goal will be the assessment of the authorisation process of pesticides in the EU, its methodology, scientific quality, and most importantly independence from the industry. We will be making recommendations to achieve a high level of protection for both human and animal health, and the environment,” Konečná concluded.

Controversial glyphosate weedkiller wins new five-year lease in Europe

EU votes to reauthorise the pesticide, ending a bitterly fought battle that saw 1.3 million people sign a petition calling for a ban

https://www.theguardian.com/environment/2017/nov/27/controversial-glyphosate-weedkiller-wins-new-five-year-lease-in-europe

Commission acts to boost trust in scientific studies on food safety

Brussels, 11 April 2018

Today the Commission is responding to the concerns expressed by citizens in a successful European Citizens' Initiative, with a proposal to improve the transparency of scientific studies in the food safety area.

Ensure more transparency,

Create a common European Register

Allow additional studies to be requested by EFSA

Require consultation of stakeholders and the public

Increase Member States' involvement

Strengthens risk communication to citizens

http://europa.eu/rapid/press-release_IP-18-2941_en.htm

Impact of a glyphosate ban

Use of less investigated herbicides

Use of other herbicides

Crucial herbicides: Dicamba, 2,4 D

Heat

Rethinking about agriculture

Soil treatment, humus layer,

Application of less or selective herbicides

Organic farming

Manuel weed control

Improvement / more mechanical weed control

Robotics

THE IMPACT OF A GLYPHOSATE BAN ON THE UK ECONOMY

SummaryReport

Improvement mechanical weed control

Robotics

Ecrobotix weeding robot

Thank you for your attention !

The problem remains unsolved – different views on the same thing

Glyphosate decision must be based on science and evidence, not politics !