Glyphosate: A Betrayed Trust and It's Remediation

Attack on Food and Agriculture Symposium

Children's Health Defense

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Objective and Responsibility of Agriculture

To provide an abundant supply of:

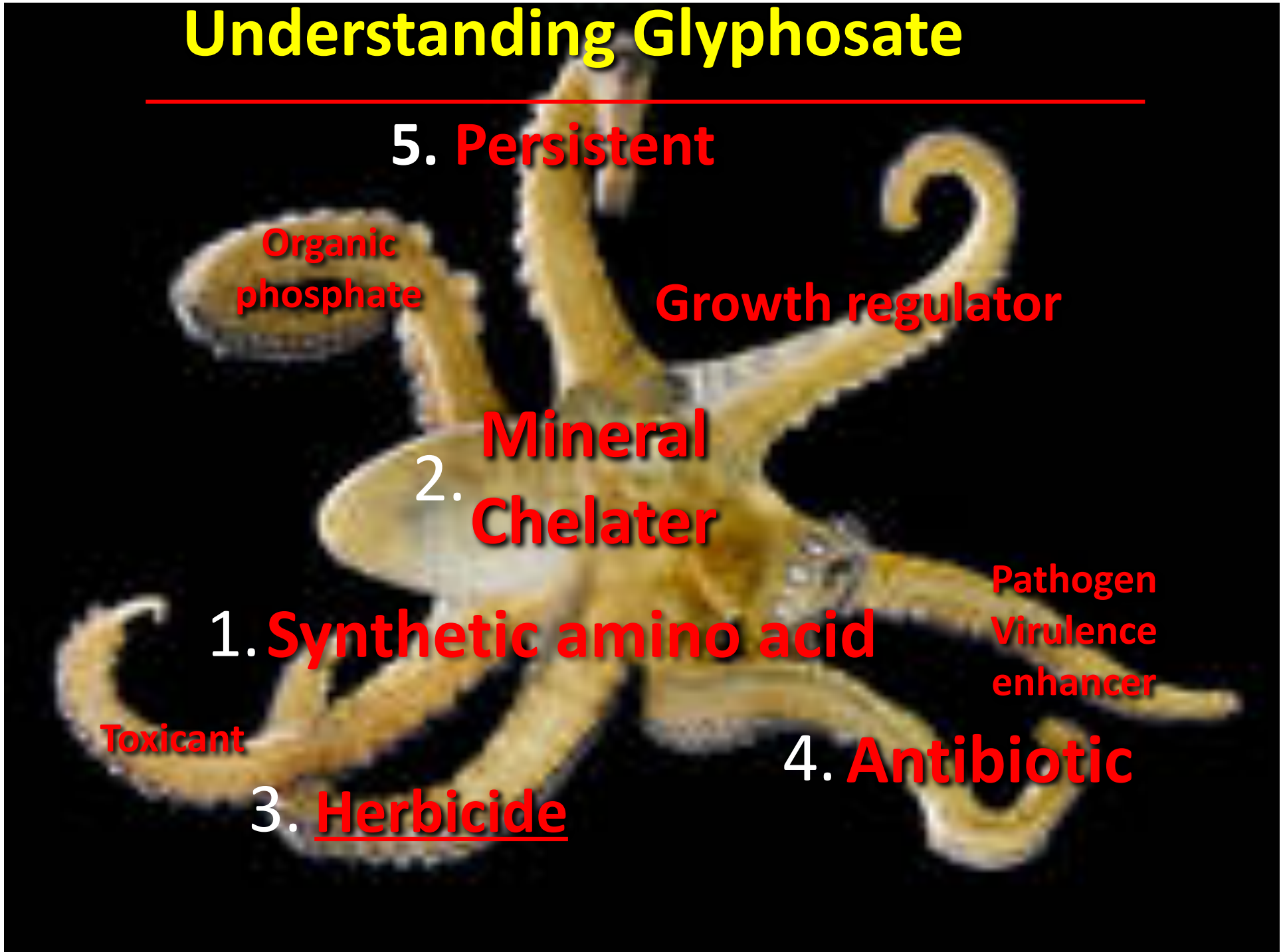
- **Safe,**
- **Affordable,**
- **Nutritious Food,**

and

and

Other commodities grown to meet societies needs.

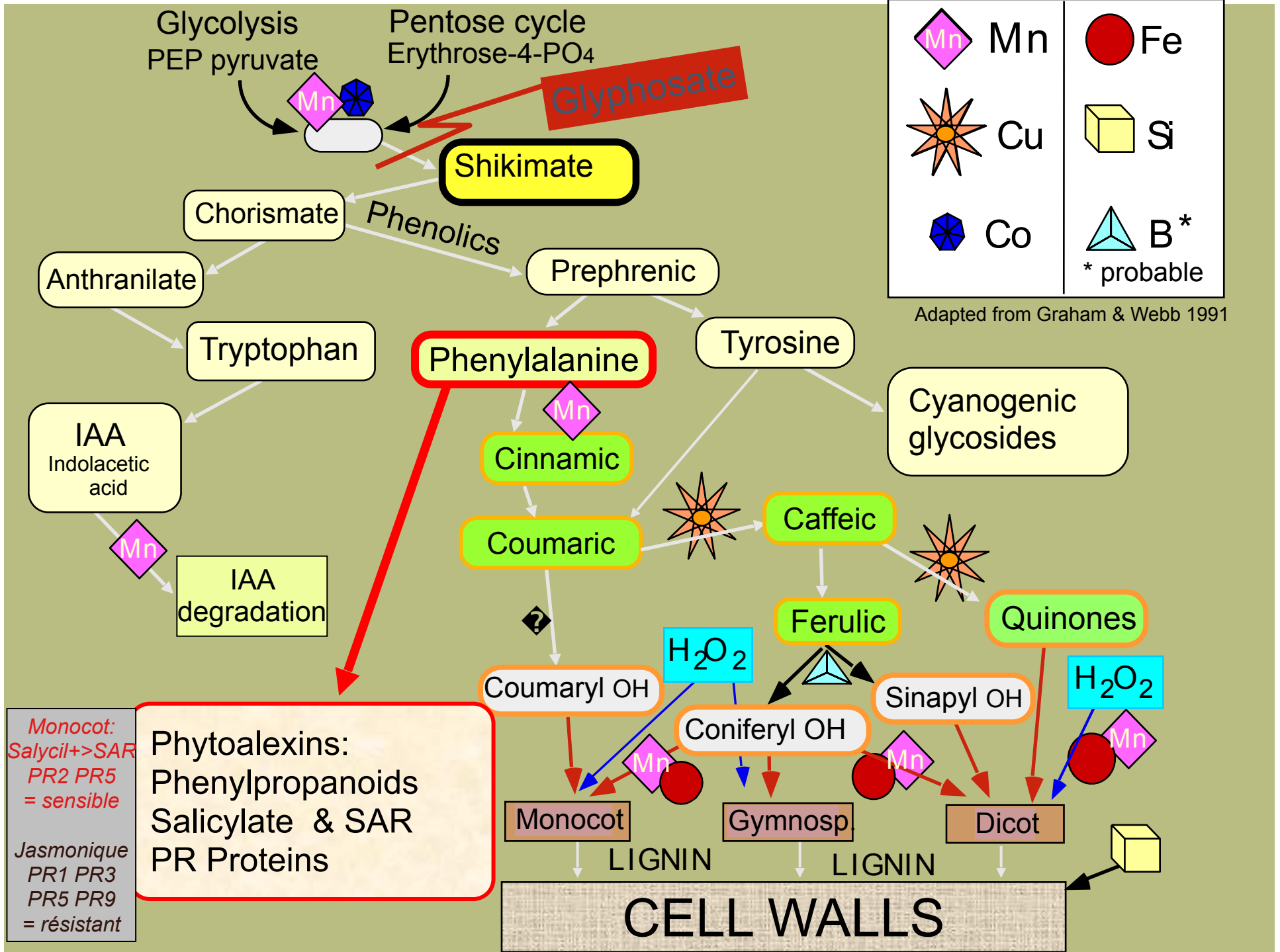
Tools


Understanding Glyphosate
5. Persistent
Organic phosphate
Growth regulator
2. Mineral Chelater
1. Synthetic amino acid
Pathogen Virulence enhancer
Toxicant
4. Antibiotic
3. Herbicide

Glyphosate was promoted as being:

- **Safe**
  - There are no long-term safety studies showing safety
  - Various studies showing
    - Carcinogenicity
    - Kidney damage
    - Liver damage
    - Intestinal toxicity
    - Neural toxicity
    - Autoimmune diseases
    - Reproductive toxicity
- **Transient** – “Poof and it’s gone” – it bioaccumulates
- **Effective** – Many resistant weeds

Shikimate Pathway



Some of the 291 Enzymes Glyphosate Down Regulates

Enzyme	-Fold change
Taurine ATP-bindingsystem	11.07
Glutamate synthase	6.06
Aminomethyl transferase	5.58
Tyrosine aminotransferase	4.36
Thioredoxin reductase	4.20
NADH dehydrogenase	4.04
Riboflavin synthase	3.57
3-phosphoadenosine-5-phosphosulfte reductase	3.75
Membrane bound ATP synthase	3.67
Acetolactate synthase	3.59
Pyridine nucleotide transhydrogenase	3.50
Shikimate kinase	3.36
3-deoxy-D-arabino-heptulosonate-7-phosphatase	3.38 (Co)
Sulfite reductase	3.19
RNAase	3.18
Glutathione S-transferase	3.04
D-amino acid dehydrogenase	3.00
Glucose-6-phosphate dehydrogenase	2.67
ATP sulfurulase	2.65
5-enolpyruvylshikimate-3-phosphate synthetase (EPSPS)	2.62 (Mn)

Average Annual Use of Glyphosate

in Agriculture 2004-2013 – by Crop*

Crop	Lbs A.I/yr	% of crop
Soybeans	101,200,000	100
Corn	63,000,000	65
Cotton	18,400,000	85
Fallow	8,800,000	55
Wheat	8,600,000	25
Citrus	3,869,000	85
Sorghum	3,000,000	40
Almonds	2,100,000	85
Grapes	1,500,000	70
Sugar beets	1,300,000	60
Tree nuts	1,120,000	75
Sunflowers	1,100,000	60
Rice	800,000	30
Beans/peas	670,000	30
Stone fruits	650,000	65

Crop	Lbs A.I/yr	% of crop
Pasture	600,000	<2.5
Barley	600,000	25
Canola	500,000	65
Apples	400,000	55
Alfalfa	400,000	<2.5
Peanuts	300,000	25
Sugar cane	300,000	45
Oats	100,000	5
Sweet Corn	100,000	15
Tomatoes	100,000	35
Potatoes	90,000	10
Avocados	80,000	45
Olives	40,000	60
Pomegranates	40,000	70

*USDA-NASS, 2015

Total Yearly Ag Use: 225,406,500 #

Residual Glyphosate Damage to Pumpkins after a RR Soybean – corn rotation

Area where sprayer nozzles were cleaned out four years previous – still a dead area, Canada (Dupmeier)

Residual Glyphosate/AMPA in Australian Farm Soils

	Glyphosate (ppb)*		AMPA (ppb)		TEG (ppb)**	
Soil type/ depth (mm)	0-10	10-30	0-10	10-30	0-10	10-30
S1 (light scrub)	<LOD	80	<LOD	60	LOD	140
S2(medium scrub)	<LOD	410	270	60	270	470
S3 (blue gum flats)	1440	<LOD	690	50	2130	50
S4 (light soil)	820	20	1350	<LOD	2170	20
S5 (heavier soil)	2,830	50	840	<LOD	3670	50
S6 (clay)	3,980	80	175	60	4,155	140

*As the soil gets ‘heavier’ (clay content), more glyphosate remains

**Teg = Total Effective Glyphosate

Case Study: Lentils (480 acres)

Objective: from 26 to 56 bu/a Lentils

Tissue (sap) analysis June 16 showed only:
Excessive N and Low Mo, P, & Zn:

Foliar applied Mo, Zn and P on June 17-18
3-days later starting turning brown
10-days later dead

Tissue analysis July 6 showed:
All nutrients fully sufficient

Harvested 7 bu/a.

What Happened to the other potential 49 bu/a?

6 Unexpected Places You'll Find Roundup

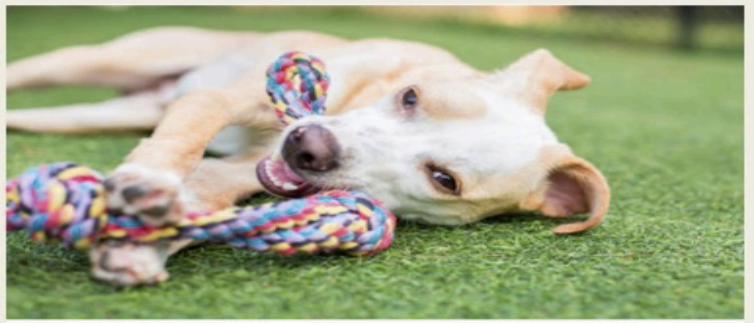
Avoiding the persistent pesticide is a lot trickier than just buying organic produce.

PIXS4U/SHUTTERSTOCK

1. Public Parks

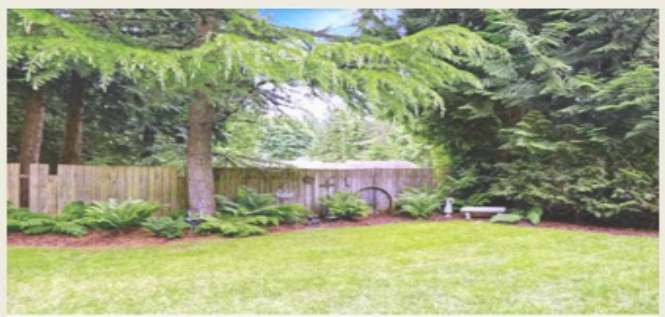
OHMEGA1982/SHUTTERSTOCK

2. Schools + Daycares



NBETWEENTHEBLINKS/SHUTTERSTOCK

3. Doggy Daycares + Parks



IRIANA SHIYAN/SHUTTERSTOCK

5. Your Own Backyard

DUDAREV MIKHAIL/SHUTTERSTOCK

4. Campgrounds + Hiking Trails

The Saga of Soggy Sauerkraut

Organic cabbage

Severity:

Severe (apple sauce texture)

Cause:

Cu (Mn) deficiency

Remediation:

Poultry manure (4 ton/a)

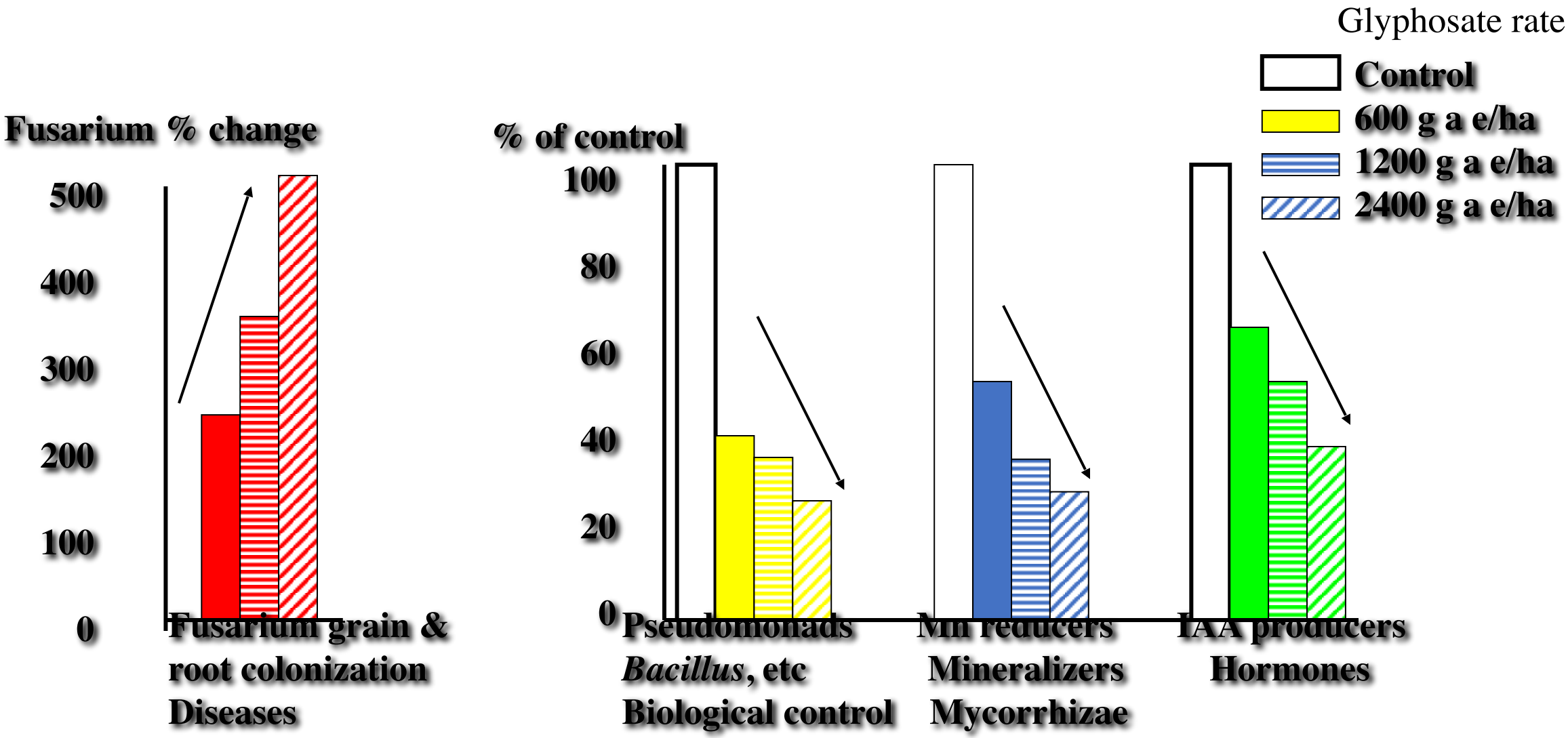
[Contaminated with 371.67 ng/g Glyphosate]

Significant Black rot

Damage:

$1,000,000 loss as ‘Soggy’ Sauerkraut

Microbiocidal Activity of Glyphosate



After Kremer and Meanes, 2007; Zobiole et al., 2010

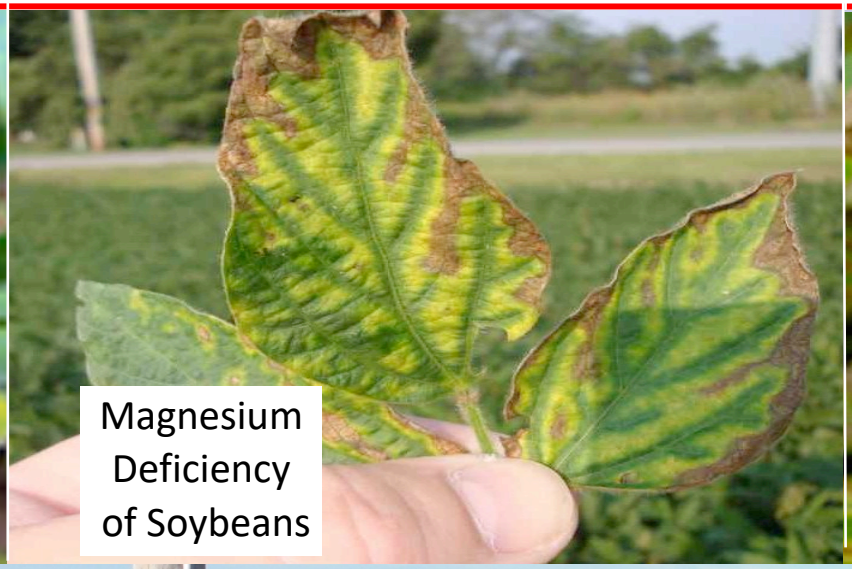
Some Plant Diseases Increased by Glyphosate

Host plant	Disease	Pathogen
Apple	Canker	*Botryosphaeria dothidea*
Banana	Panama	*Fusarium oxysporum* f.sp. *cubense*
Barley	Root rot	*Magnaporthe grisea*
Beans	Root rot	*Fusarium solani* f.sp. *phaseoli*
Bean	Damping off	*Pythium* spp.
Bean	Root rot	*Thielaviopsis bassicola*
Canola	Crown rot	*Fusarium* spp.
Canola	Wilt	*Fusarium oxysporum*
Citrus	CVC	*Xylella fastidiosa*
Corn	Root and Ear rots	*Fusarium* spp.
Cotton	Damping off	*Pythium* spp.
Cotton	Bunchy top	Manganese deficiency
Cotton	Wilt	*F. oxysporum* f.sp. *vasinfectum*
Grape	Black goo	*Phaeomoniella chlamydospora*
Melon	Root rot	*Monosporascus cannonballus*
Soybeans	Root rot, Target spot	*Corynespora cassiicola*
Soybeans	White mold	*Sclerotinia sclerotiorium*
Soybeans	SDS	*Fusarium solani* f.sp. *glycines*
Sugar beet	Rots, Damping off	*Rhizoctonia and* Fusarium
Sugarcane	Decline	*Marasmius* spp.
Tomato	Wilt (New)	*Fusarium oxysporum* f.sp. *pisi*
Various	Canker	*Phytophthora* spp.
Weeds	Biocontrol	*Myrothecium verucaria*
Wheat	Bare patch	*Rhizoctonia solani*
Wheat	Glume blotch	*Septoria* spp.
Wheat	Root rot	*Fusarium* spp.
Wheat	Head scab	*Fusarium graminearum*
Wheat	Take-all	*Gaeumannomyces graminis*


Fusarium scab


Take-all root rot

Similarity of Mn+Mg deficiency & Sudden Death Syndrome of Roundup Ready Soybeans



Food and Feed Safety Concerns with Glyphosate

- **Reduced nutrient density**
  - Co, Cu, Fe, Mg, Mn, Zn
- **Increased levels of toxic products**
  - Mycotoxins [Fusarium toxins (DON, NIV, ZEA), aflatoxins]
  - Allergenic proteins and metabolic toxins
- **Premature ageing, reproductive failure**
- **Ecological disruption**
  - bees, amphibians, plant diversity, GI tract, soil, etc.
- **Gene flow** - weeds, soil microbes, intestinal microbes
- **Direct toxicity of glyphosate**
  - Cell death, immune failure, disease resistance
  - Endocrine system, infertility, birth defects, teratogenicity

Direct Toxicity of Glyphosate

Rate (ppm)	System affected	Reference
0.5	Human cell endocrine disruption	Toxicology 262:184-196, 2009
0.5	Anti-androgenic	Gasner et al, 2009
1.0	Disrupts aramatase enzymes	Gasnier et al, 2009
1-10	Inhibits LDH, AST, ALF enzymes	Malatesta et al, 2005
1-10	Damages liver, mitochondria, nuclei	Malatesta et al, 2005
2.0	Anti-Oestrogenic	Gasnier et al, 2009
5.0	DNA damage	Toxicology 262:184-196, 2009
5.0	Human placental, umbilical, embryo	Chem.Res.Toxicol.J. 22:2009
10	Cytotoxic	Toxicology 262:184-196, 2009
10	Multiple cell damage	Seralini et al, 2009
10	Total cell death	Chem.Res.Toxicol.J. 22:2009
All	Systemic throughout body	Andon et al, 2009
1-10	Suppress mitochondrial respiration	Peixoto et al, 2005
	Parkinson's	El Demerdash et al, 2001
POEA, AMPA even more toxic		Seralini et al, 2009

Toxicity to and Impact of Glyphosate on Poultry Intestinal Microflora after Clair et al, 2012;Shehata et al, 2012; Krueger et al, 2012

Beneficials (Sensitive)	Pathogens (Resistant)
Enterococcus faecalis	*Salmonella entritidis*
Enterococcus faecium	*Salmonella gallinarum*
Bacillus badius	*Salmonella typhimurium*
Bifidobacterium adolescentis	*Clostridium perfringens*
Lactobacillus spp.	*Clostridium botulinum*
Campylobacter spp.	*Clostridium deficale*
Geotrichum candidum	*Escherichia coli*
Lactococcus lactis subsp. *cremoris*	*Enterobacter cloacae*
Lactobacillus delbrueckii subsp. *bulgaricus*	

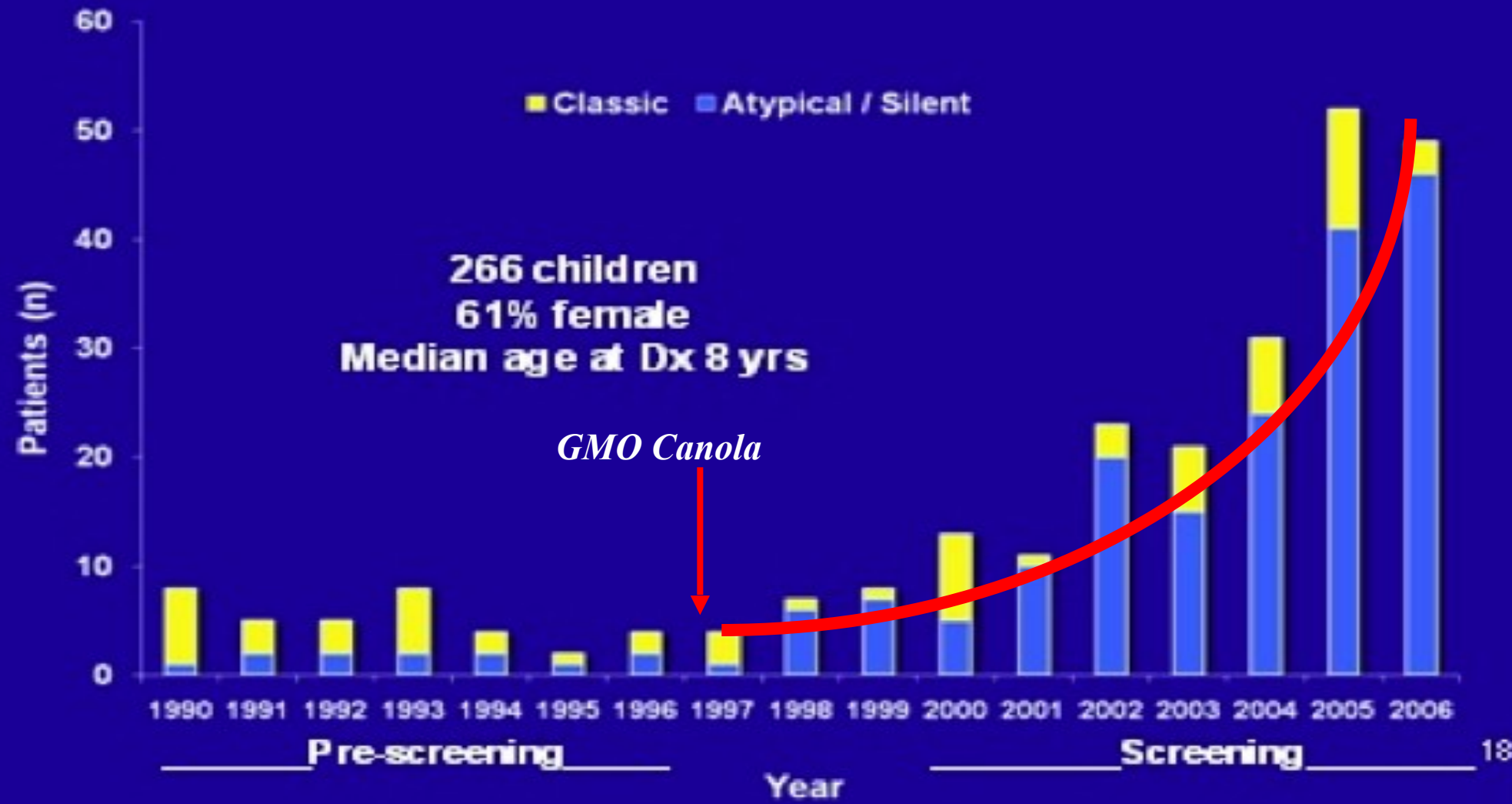
Botulism in Dairy Cattle

Chronic, toxic co-infection, neurotoxin produced in the rumen

Normal stomach

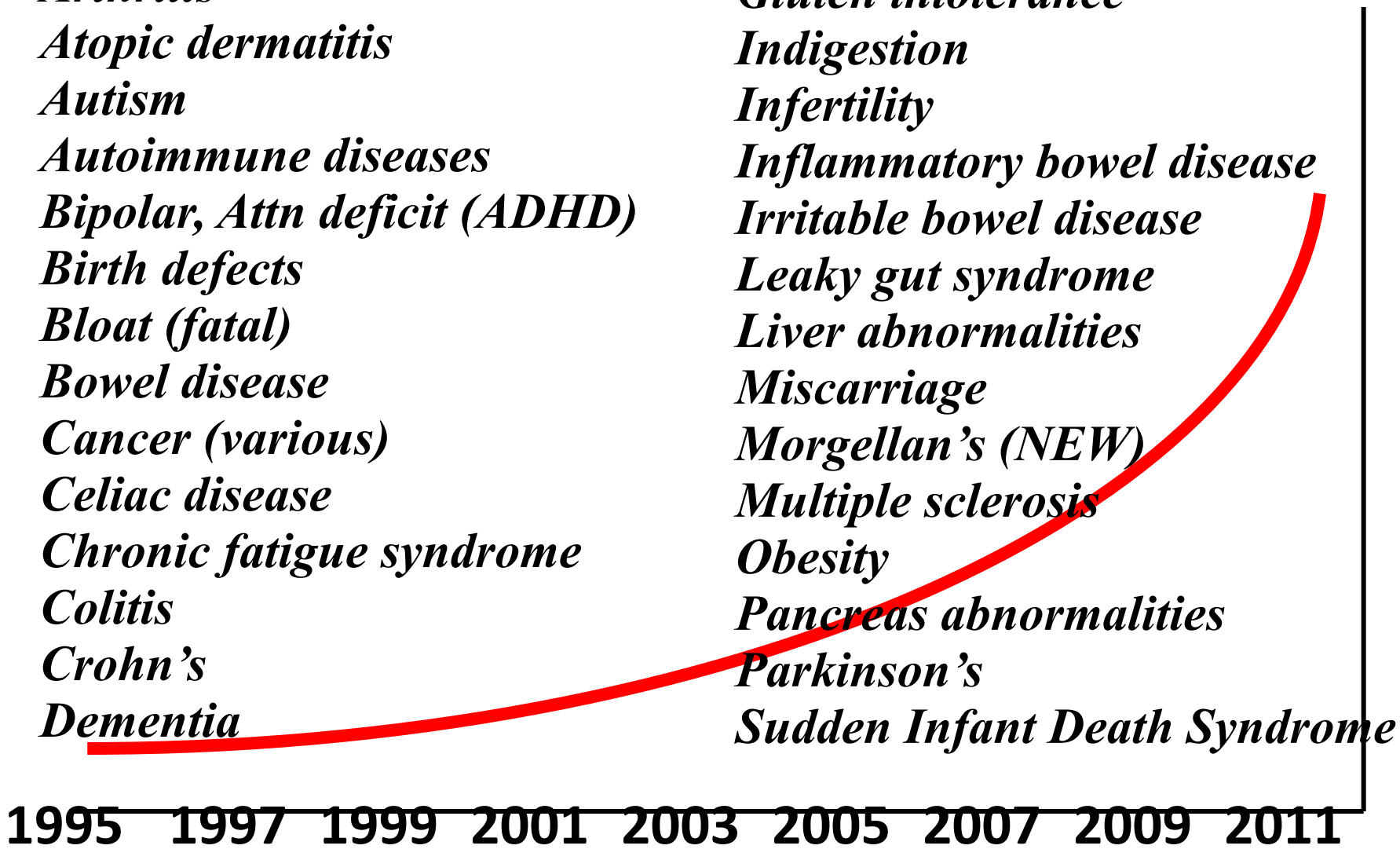
Chronic botulism

Children Diagnosed with Celiac Disease at Alberta Childrens' Hospital



Diseases Increasing in Incidence (Epidemic)

Allergies, Asthma
Alzheimer's
Arthritis
Atopic dermatitis
Autism
Autoimmune diseases
Bipolar, Attn deficit (ADHD)
Birth defects
Bloat (fatal)
Bowel disease
Cancer (various)
Celiac disease
Chronic fatigue syndrome
Colitis
Crohn's
Dementia
Diabetes
Difficale diarrhea
Gluten intolerance
Indigestion
Infertility
Inflammatory bowel disease
Irritable bowel disease
Leaky gut syndrome
Liver abnormalities
Miscarriage
Morgellan's (NEW)
Multiple sclerosis
Obesity
Pancreas abnormalities
Parkinson's
Sudden Infant Death Syndrome



Glyphosate Immobilization

- Chelation
- Clay entrapment

Glyphosate Degradation

- Raw sauerkraut juice
- Biological cocktail

Detox Glyphosate – Immobilized

Residual soil glyphosate, Contaminated Manure, etc.

Chelation – immobilizes glyphosate. Still present but tied up. Filter strips.

"Kicks the can down the road"

Can be reactivated with P to be an active herbicide

Waiting for a future disaster –

- **Soggy Sauerkraut**
- **Lentils 2023**
- **Lake Erie algal bloom**

Effect of Gypsum on Coffee Growing in a glyphosate Contaminated soil (M. Kraidy)

Biological Degradation of Residual Soil Glyphosate, 2022

Treatment	Yield	Increase	Silage	Increase
	bu/a[1]	bu/a	ton/a	ton/a
Untreated Control	235.56	0.00	33.58	0.00
Raw Sauerkraut Juice[2]	242.85	7.29	35.39	1.81
PaleoGro (32 oz/a)	238.53	2.97	34.19	0.61
RSKJ + PaleoGro	246.40	10.84	36.26	2.68

[1]All data are the average of four randomly replicated plots, AgriTech, Wisconsin

[2]Raw Sauerkraut juice (15 gal/a)

You can’t see it, taste it, or smell it,
but it can slowly kill you!

Future historians may well look back and write about our time, not about how many pounds of pesticide we did or did not apply; but about how willing we are to *sacrifice our children and jeopardize future generations* with this massive use of glyphosate that is based on *false promises* and *flawed science*, just to benefit the "bottom line" of a commercial enterprise.

Dr. Don M. Huber, Professor Emeritus, Purdue University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