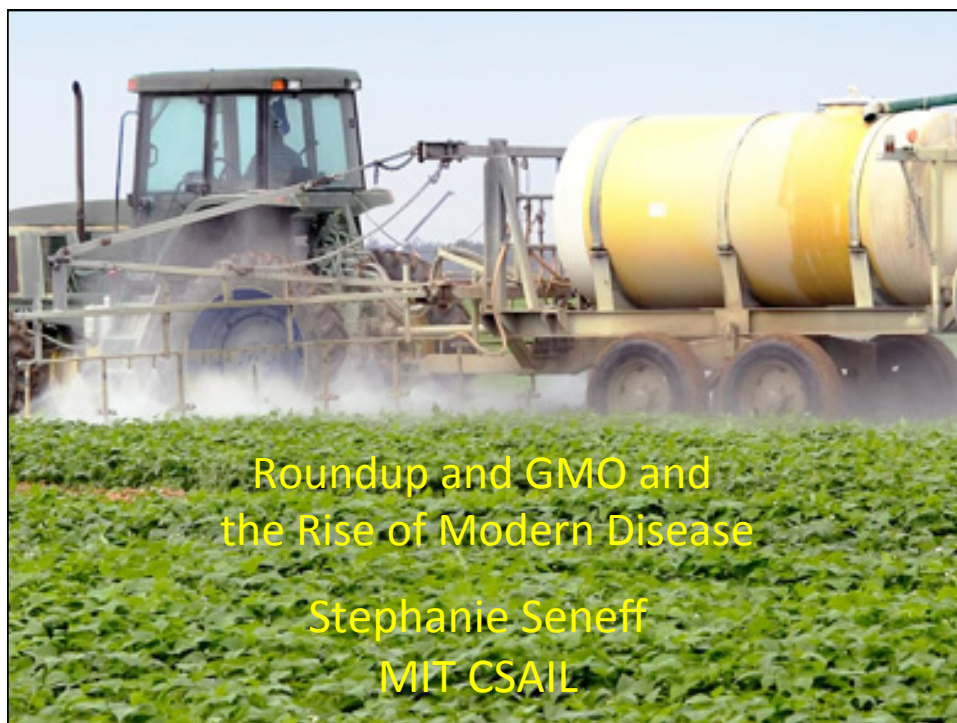


Download These Slides!

<http://people.csail.mit.edu/seneff/Oahu2015.pdf>



Roundup and GMO and
the Rise of Modern Disease

Stephanie Seneff
MIT CSAIL

**In a time of universal deceit,
telling the truth is a revolutionary act.**

— George Orwell

**You never change things by fighting the
existing reality.**

**You change something by building a new
world that makes the existing model
obsolete.**

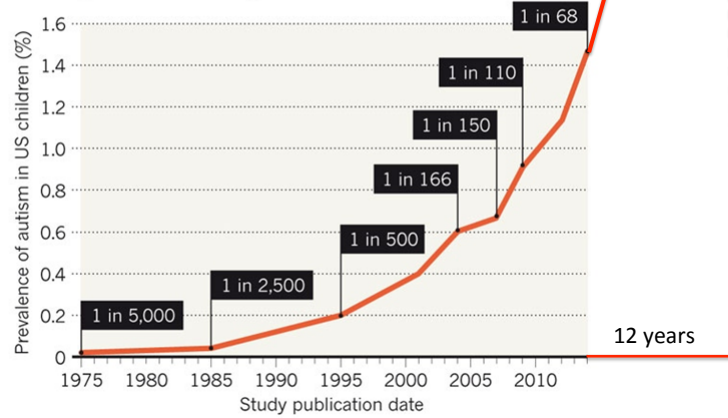
— Buckminster Fuller

A Frightening Trend*



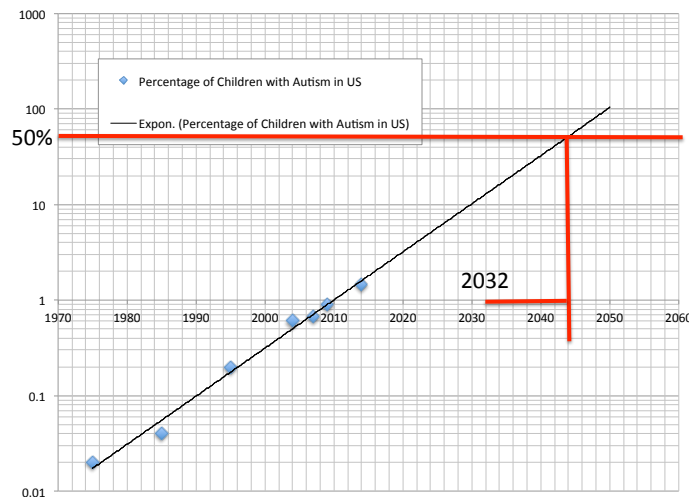
AUTISM DIAGNOSES RISING

Almost 1.5% of US children are now diagnosed with autism, according to data from 11 regions in the United States.

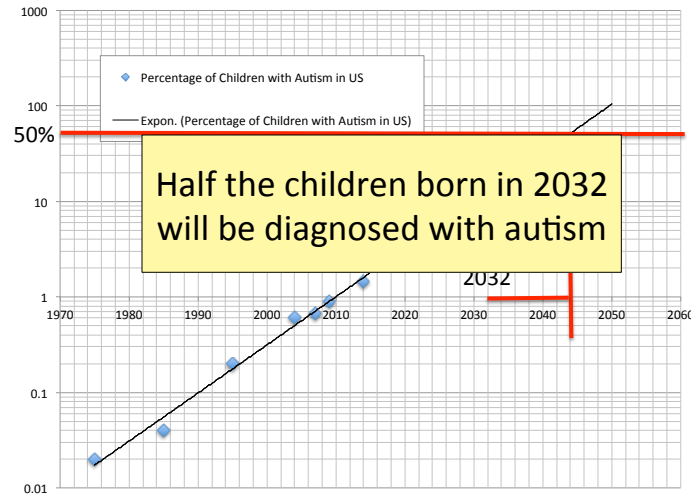


*K. Weintraub, Nature 479, Nov. 3 2011, 22-24.

Percentage of children with Autism in the US

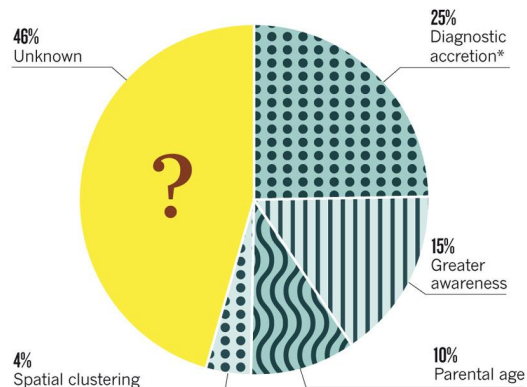


Percentage of children with Autism in the US



“If it is an environmental cause contributing to an increase, we certainly want to find it.”*

Reasons: unclear



*Children who formerly would have been diagnosed solely with mental retardation

*K. Weintraub, Nature 479, Nov. 3 2011, 22-24.

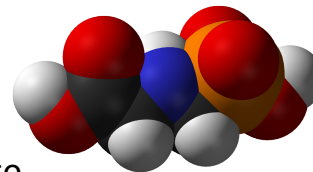


Outline

- History of Glyphosate & GMOs
- Glyphosate and Autism
- Glyphosate and Vaccines
- Breast Cancer
- Glyphosate, Oxalate and Anemia
- Chondroitin Sulfate and the Skeleton
- Glyphosate and Climate Change
- Summary

History of Glyphosate and GMOs

Is Glyphosate Toxic?



- Monsanto has argued that glyphosate is harmless to humans because our cells don't have the shikimate pathway, which it inhibits
- However, our gut bacteria DO have this pathway
 - We depend upon them to supply us with essential amino acids (among many other things)
- Other ingredients in Roundup greatly increase glyphosate's toxic effects
- Insidious effects of glyphosate accumulate over time
 - Most studies are too short to detect damage

Paper Published in 2013

Entropy **2013**, *15*, 1416-1463; doi:10.3390/e15041416

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entropy

ISSN 1099-4300

www.mdpi.com/journal/entropy

Review

Glyphosate's Suppression of Cytochrome P450 Enzymes and Amino Acid Biosynthesis by the Gut Microbiome: Pathways to Modern Diseases

Anthony Samsel ¹ and Stephanie Seneff ^{2,*}

Main Chemical Effects of Glyphosate*

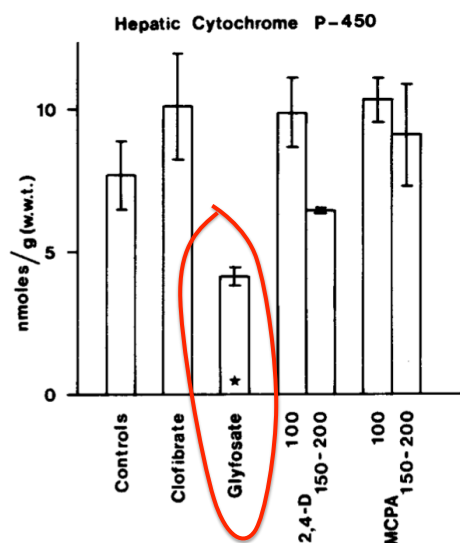
- Interferes with function of cytochrome P450 (CYP) enzymes
- Chelates important minerals (iron, cobalt, manganese, etc.)
- Interferes with synthesis of aromatic amino acids and methionine
 - Leads to shortages in critical neurotransmitters and folate
- Disrupts sulfate synthesis and sulfate transport

*Samsel and Seneff, *Entropy* **2013**, *15*, 1416-1463

Glyphosate: The Central Mechanisms

- Glyphosate acts as an antibiotic to disrupt gut bacteria, leading to overgrowth of pathogens
- Disruption of liver CYP enzymes leads to impaired bile flow and low vitamin D
 - This disrupts sulfate synthesis and transport
 - Also impairs detoxification of other toxic chemicals
- Damage to red blood cells leads to anemia and toxicity due to free iron
 - Hypoxia ensues → low grade encephalopathy
- Leaky gut and leaky brain barrier lead to neuronal exposure to dangerous metals and neurotoxins

Inhibition of Cytochrome P450 Enzymes (CYPs) by Various Pesticides*



Study in rats on
2,4-D, clofibrate,
MCPA, and
glyphosate

*E Hetanen et al., Acta Pharmacol.
Et Toxicol. 1983, 53, 103-112.

Glyphosate Depletes Iron, Manganese and Zinc in Plants*

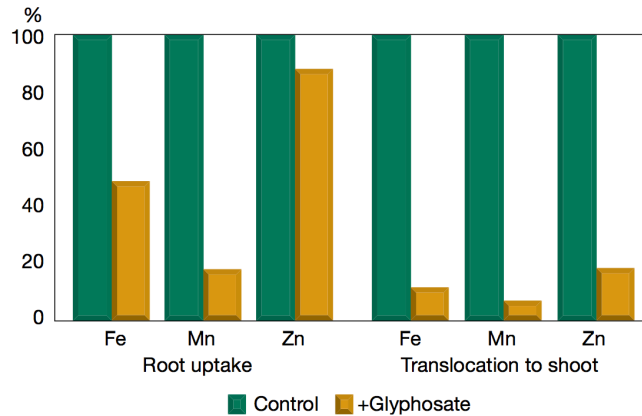
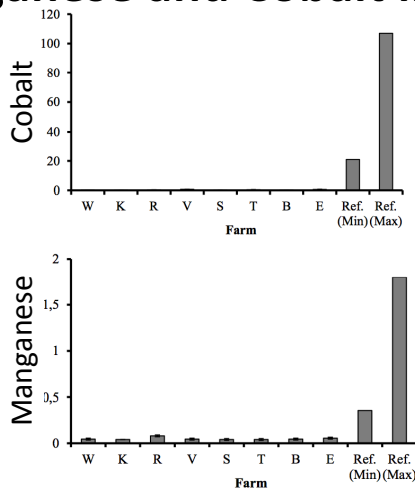


Figure 1. Effect of glyphosate* on nutrient uptake and translocation by "non-target" plants, Eker, et al. 2006. (* 2.5% of recommended herbicidal rate of glyphosate.)

*D Huber, What About Glyphosate-Induced Manganese Deficiency? Fluid Journal, 20-22.

Severe Deficiency in Serum Manganese and Cobalt in Cows*



Eight different farms: all cows tested had glyphosate in the urine

*M. Krüger et al., J Environ Anal Toxicol 2013, 3:5

The Enhancing Effect of Adjuvants*

“Adjuvants in pesticides are generally declared as inerts, and for this reason they are not tested in long-term regulatory experiments. It is thus very surprising that they amplify *up to 1000 times* the toxicity of their APs [Active Principles] in 100% of the cases where they are indicated to be present by the manufacturer.”

*R. Mesnage et al. BioMed Research International 2014; Article ID:179691.

Roundup Safety Claims Disputed*

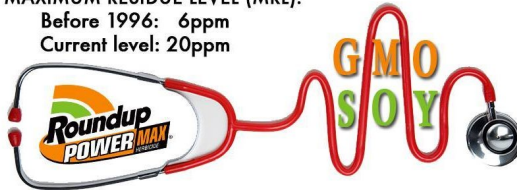
“It is commonly believed that Roundup is among the safest pesticides. ... Despite its reputation, *Roundup was by far the most toxic among the herbicides and insecticides tested*. This inconsistency between scientific fact and industrial claim may be attributed to huge economic interests, which have been found to falsify health risk assessments and *delay health policy decisions*.”

*R. Mesnage et al., Biomed Research International, Volume 2014 (2014), Article ID 179691

While it was claimed that the GMO Roundup-Ready Crops (corn, soy, canola, sugar beets, cotton, tobacco and alfalfa) would lead to *less* glyphosate usage, the exact opposite has happened, due to the appearance of multiple “Roundup-Ready” weeds

**SINCE THE INTRODUCTION
OF **GMO SOY**
THE EPA HAS INCREASED THE ALLOWABLE
RESIDUE OF GLYPHOSATE ON SOY BY **233%****

MAXIMUM RESIDUE LEVEL (MRL):
Before 1996: 6ppm
Current level: 20ppm



MRL values appear to have been increased, not based on new scientific evidence, but in response to actual observed increases in the content of residues in glyphosate-tolerant GM soybeans.

**Weed resistance goes up.
Glyphosate usage goes up. Medical bills go up?**



www.facebook.com/gmofreeusa www.facebook.com/gmofreeusa www.facebook.com/gmofreeconadogroup

Paper Recently Published

Journal of Organic Systems, 9(2), 2014

ORIGINAL PAPER

Genetically engineered crops, glyphosate and the deterioration of health in the United States of America

Nancy L. Swanson¹, Andre Leu^{2*}, Jon Abrahamson³ and Bradley Wallet⁴

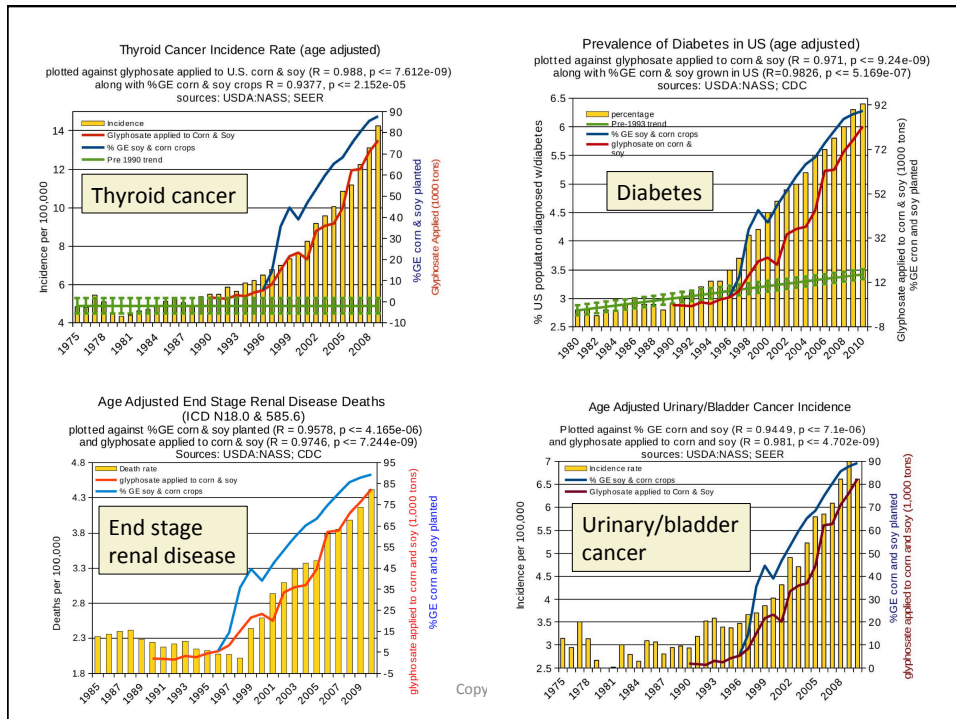
¹ Abacus Enterprises, Lummi Island, WA, USA

² International Federation of Organic Agricultural Movements, Bonn, Germany

³ Abacus Enterprises, Lummi Island, WA, USA

⁴ Crustal Imaging Facility, Conoco Phillips School of Geology and Geophysics, University of Oklahoma, USA

* Corresponding author: andreleu.ai@gmail.com



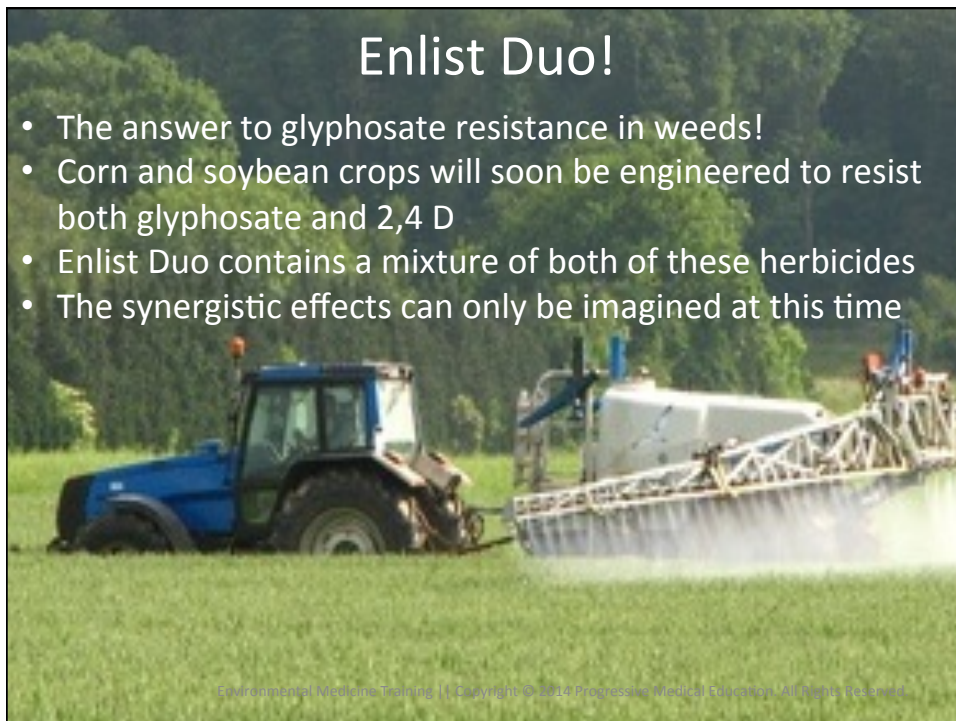
Quote from the Conclusion*

“Although correlation does not necessarily mean causation, when correlation coefficients of over 0.95 (with p -value significance levels less than 0.00001) are calculated for a list of diseases that can be directly linked to glyphosate, via its known biological effects, it would be imprudent not to consider causation as a plausible explanation.”

*NL Swanson et al. Journal of Organic Systems 9(2), 2014, p. 32,

Enlist Duo!

- The answer to glyphosate resistance in weeds!
- Corn and soybean crops will soon be engineered to resist both glyphosate and 2,4 D
- Enlist Duo contains a mixture of both of these herbicides
- The synergistic effects can only be imagined at this time

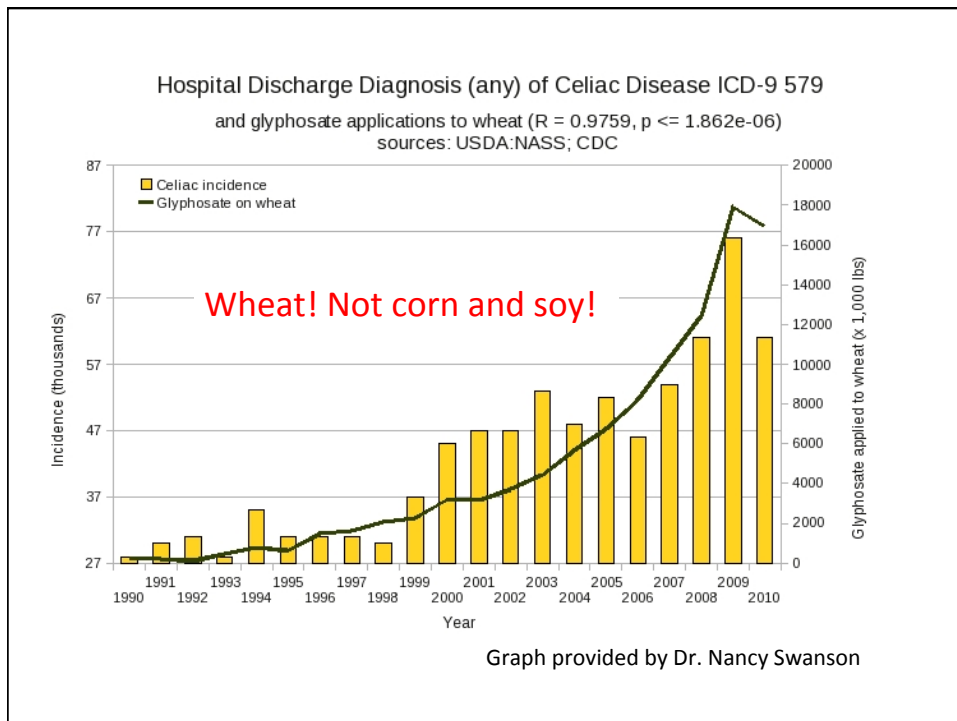


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Gluten Intolerance or Glyphosate Intolerance?

- Glyphosate: the key ingredient in Monsanto's RoundUp
- Routinely used to "dry down" wheat prior to harvest
- Linked to celiac disease, gluten intolerance, and irritable bowel

Get the facts. Share the awareness.
facebook.com/gmoawarenessusa





Human Dietary Experiment on Wheat & Inflammatory Bowel Syndrome*

- Significant improvement in symptoms with dietary organic wheat from ancient source

- Abdominal pain ($P < 0.0001$)
- Bloating ($P = 0.004$)
- Stool consistency ($P < 0.001$)
- Tiredness ($P < 0.0001$)



- Reduced pro-inflammatory cytokines: IL-6, IL-17, interferon-gamma, VEGF

*F. Sofi et al., Br J Nutr. 2014 Feb 13:1-8. [Epub ahead of print]

Glyphosate and Autism

New Study*

Nevison *Environmental Health* 2014, **13**:73
<http://www.ehjournal.net/content/13/1/73>



RESEARCH

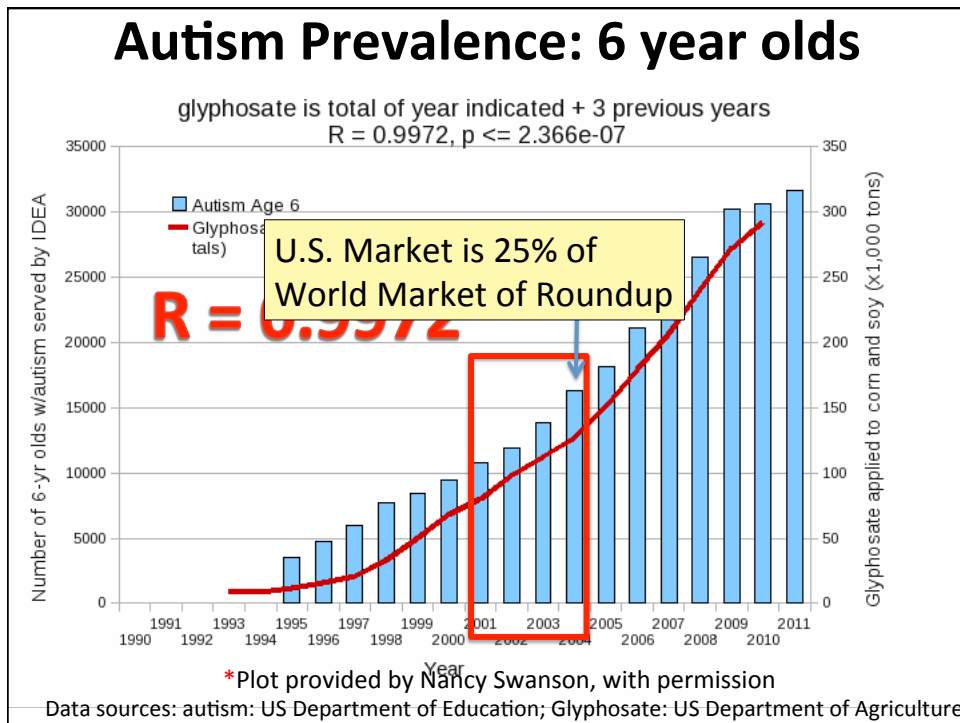
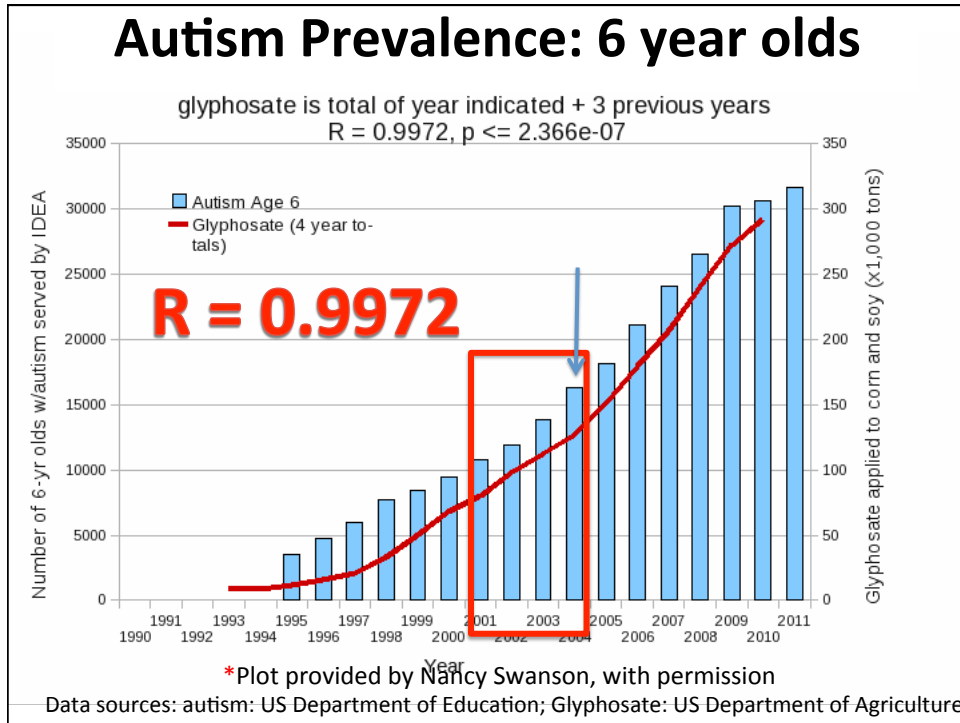
Open Access

A comparison of temporal trends in United States autism prevalence to trends in suspected environmental factors

Cynthia D Nevison

- Data suggest ~75-80% of the tracked increase in autism since 1988 is due to *an actual increase* in the disorder rather than to changing diagnostic criteria
- Polybrominated diphenyl ethers (fire retardants), *aluminum* adjuvants, and the herbicide *glyphosate* have increasing trends that correlate positively to the rise in autism.

*C. Nevison *Environmental Health* 2014;13:73.

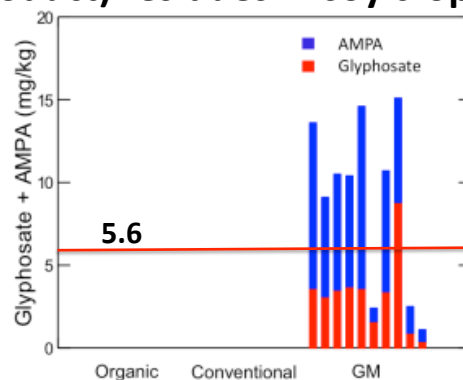


Glyphosate Test Report: Findings in American Mother's Breast milk, urine and water*

- Moms Across America initiative!
- Breast milk levels ranging from 76 ug/l to 166 ug/l are 760 to 1600 times higher than the European Drinking Water Directive allows
- Urine testing shows glyphosate levels over 10 times higher than in Europe
- Monsanto is wrong regarding bioaccumulation

*Posted on Apr 6 2014 - 4:19am by Sustainable Pulse

Study of glyphosate and AMPA (breakdown product) residues in soy crops*



“Another claim of Monsanto's has been that residue levels of up to **5.6 mg/kg** in GM-soy represent “...*extreme levels*, and far higher than those typically found” (Monsanto 1999).

www.greenmedinfo.com/blog/how-extreme-levels-roundup-food-became-industry-normal

Soy Formula Linked to Seizures in Autism*

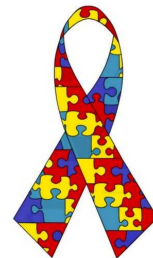
"There was a 2.6-fold higher rate of febrile seizures, a 2.1-fold higher rate of epilepsy comorbidity and a 4-fold higher rate of simple partial seizures in the autistic children fed soy-based formula"



*CJ Westmark, PLOSOne March 12, 2014, DOI: 10.1371/journal.pone.0080488.

Some Biomarkers for Autism

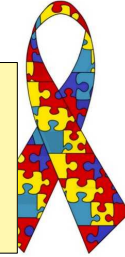
- Disrupted gut bacteria; inflammatory bowel
- Low serum sulfate
- Methionine deficiency
- Serotonin and melatonin deficiency
- Defective aromatase
- Zinc and cobalamin deficiency
- Urinary p-cresol
- Mitochondrial disorder
- Seizures; Glutamate toxicity in the brain



Some Biomarkers for Autism

- Disrupted gut bacteria; inflammatory bowel
- Low serum sulfate

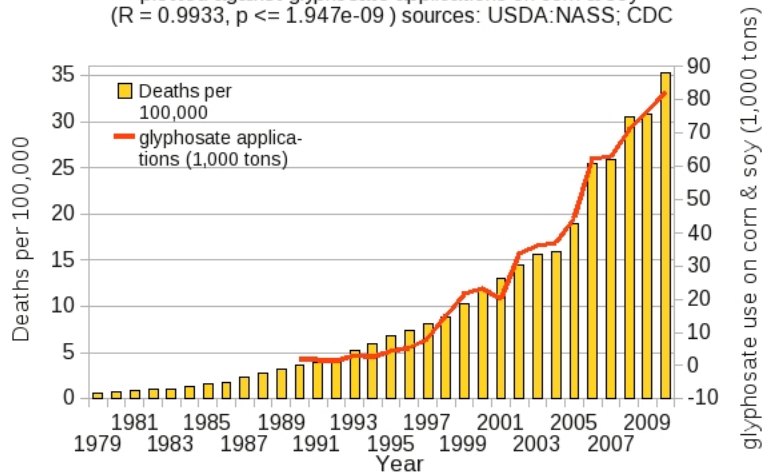
These can all be explained as potential effects of glyphosate on biological systems



- Zinc and iron deficiency
- Urinary p-cresol
- Mitochondrial disorder
- Seizures; Glutamate toxicity in the brain

Dementia and Autism Have Much in Common

Deaths from Senile Dementia (ICD F01, F03 & 290)
 plotted against glyphosate applications on corn & soy
 (R = 0.9933, p <= 1.947e-09) sources: USDA:NASS; CDC



Plot kindly provided by Nancy Swanson

Glyphosate and Vaccines

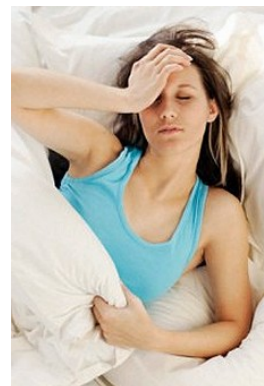
Case Study: Evidence that Glyphosate Penetrates the Brain Barrier*

- 58 year old woman ingested glyphosate (suicide attempt)
- Glyphosate showed up in blood (1294 µg/mL) and cerebrospinal fluid (122 µg/mL)
- Associated with both disseminated intravascular coagulation (DIC) and aseptic meningitis

*C Sato et al., Clinical Toxicology (2011) 49, 118–120

Glyphosate Suppresses Melatonin Synthesis!

- Glyphosate interferes with shikimate pathway in plants and microbes → tryptophan depletion*
- Tryptophan is sole precursor to melatonin
- Melatonin binds to aluminum, cadmium, copper, iron and lead, reducing their toxicity**
- Melatonin is produced by the pineal gland and regulates the wake/sleep cycle



*N. de María et al., J Agric Food Chem 2006, 54, 2621-2628.

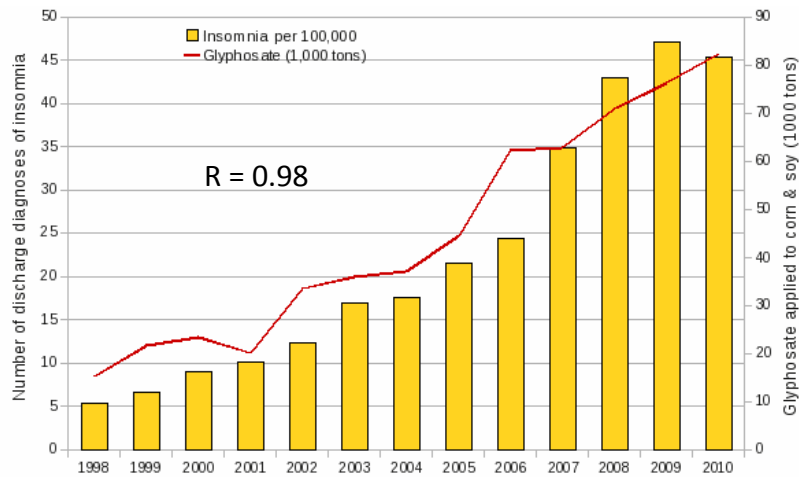
**J. Limson et al. J. Pineal Res. 1998; 24:15–21.

Sleep Disorder, Aluminum, and the Pineal Gland

- Sleep disorder is linked to many neurological diseases:
 - Autism, Alzheimer's, ADHD, depression, schizophrenia, ALS, Parkinson's disease, etc.
- Insomnia occurs much more frequently as an adverse reaction to vaccines containing aluminum than to those not containing aluminum ($p < 0.0025$)*
- Insomnia also occurs much more frequently in ALL adverse reactions after the year 2000 compared to before 2000 ($p < 0.009$)*
- Pineal gland is heavily perfused and outside of the blood brain barrier
 - Susceptible to aluminum toxicity

*Seneff et al., *Entropy* **2012**, 14, 2227-2253.

Insomnia is Strongly Correlated with Glyphosate Usage



Plot provided by Dr. Nancy Swanson; Data from CDC Hospital Discharge database

Aluminum in the Pineal Gland*

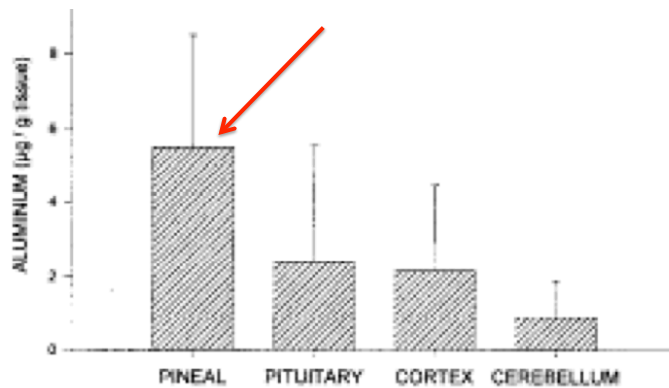


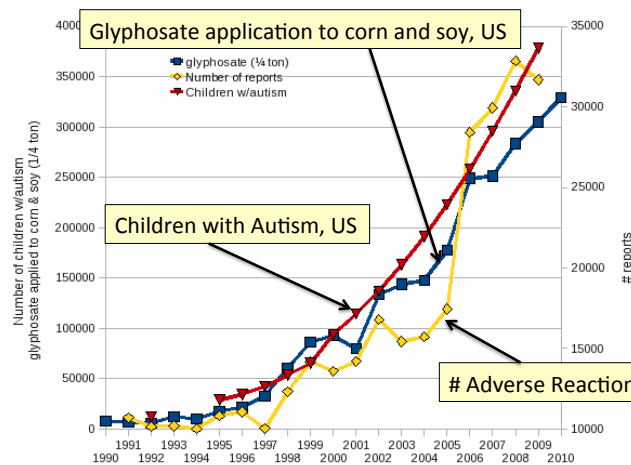
Fig. 6. Aluminum contents of brain tissues (mean ± SD). The results are expressed per unit weight of dried tissues. Four samples of each tissue were examined.

*S.B. Lang et al./Bioelectrochemistry and Bioenergetics 41(1996)191—195

Glyphosate and Aluminum: Partners in Crime

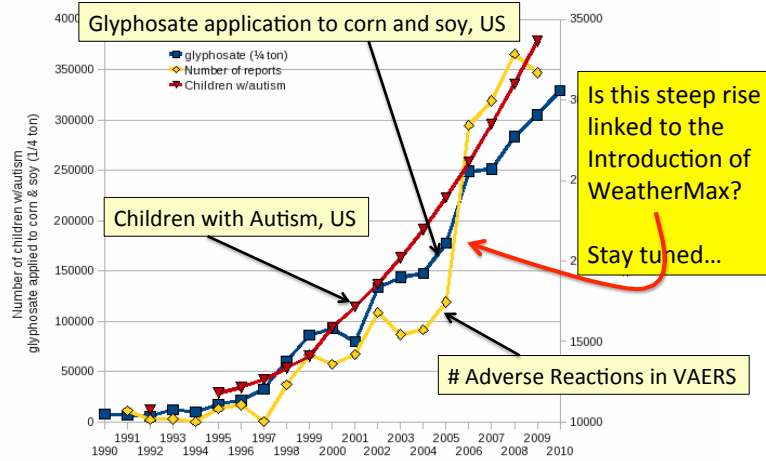
- Glyphosate induces pathogens like *C. difficile* in gut, leading to *leaky gut syndrome*
 - *C. diff* produces *p-cresol* which promotes aluminum uptake by cells
 - p-Cresol is a known biomarker for autism
 - p-Cresol is an important factor in *kidney failure* which leads to aluminum retention in tissues → dementia
- Glyphosate *cages* aluminum to promote entry
- Glyphosate promotes *calcium uptake* by voltage-activated channels
 - Aluminum gains entry as calcium mimetic

Autism, Glyphosate, Vaccine Reactions*



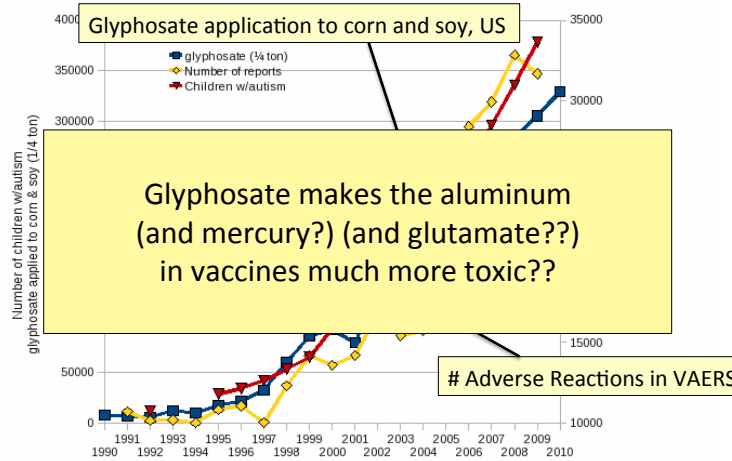
*Collaboration with Dr. Nancy Swanson

Autism, Glyphosate, Vaccine Reactions*



*Collaboration with Dr. Nancy Swanson

Autism, Glyphosate, Vaccine Reactions*



*Collaboration with Dr. Nancy Swanson

Glyphosate enhances aluminum toxicity

Glyphosate interferes with acetaminophen metabolism

Entropy **2012**, *14*, 2227–2253; doi:10.3390/e14112227

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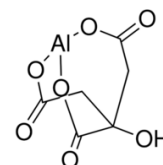
Review

Empirical Data Confirm Autism Symptoms Related to Aluminum and Acetaminophen Exposure

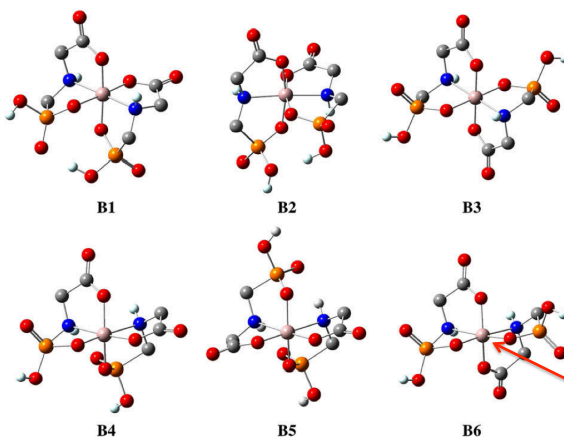
Stephanie Seneff ^{1,*}, Robert M. Davidson ² and Jingjing Liu ¹

Aluminum Glyphosate*

Six different ways two glyphosate molecules can chelate aluminum



Aluminum citrate**



ALUMINA

aluminum

*M. Purgel et al., *Journal of Inorganic Biochemistry* 103 (2009) 1426–1438

** P. Sianina et al., *Clin. Chem.* 32/3, 539–541, 1986.

MMR and Autism

- Andrew Wakefield found a connection in 1998 in a now retracted publication*
- CDC claimed proof of no link in 2004 paper**
- Whistleblower, Dr. William Thompson, has just come forward:
 - Data supported significant increased risk for autism in black males with early vaccine
 - Demand for birth certificate hid this finding
- I believe it has to do with glutamate!

*A Wakefield et al., *The Lancet* 1998; **351** (9103): 637–41. (RETRACTED)

**F DeStefano et al., *Pediatrics* 2004;113;259-266 .

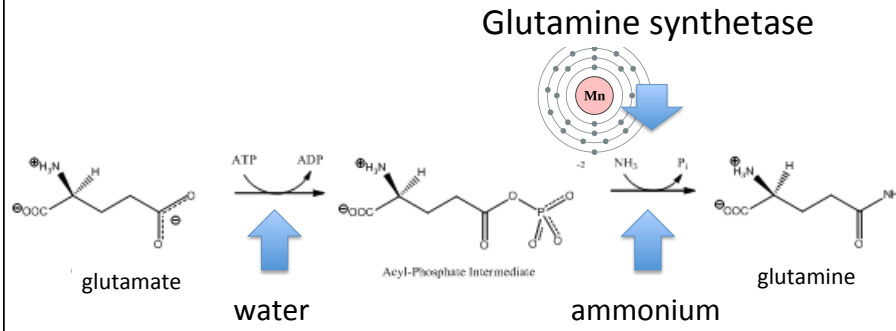
Glutamate is an Additive in Vaccines!

- Flu vaccines (FluMist), MMR (measles, mumps and rubella), Rabies vaccine and Varicella vaccine (chicken pox) all contain glutamate
- Anecdotal evidence links these vaccines with autism
- My own studies on VAERS revealed a correlation between autism and MMR*
- **Glyphosate's depletion of manganese prevents glutamate breakdown**



*S. Seneff et al., *Entropy* 2012, 14, 2227-2253.

Glutamate Detoxification Depends on Manganese!



Ammonium and glutamate toxicity in the brain can arise because of insufficient manganese

“Alteration of Plasma Glutamate and Glutamine Levels in Children with High-Functioning Autism”*

Amino acid	Control	HFA	p-value
Alanine	326.1±61.6	300.3±55.0	0.145
α-Aminobutyric acid	18.8±3.8	18.7±5.4	0.971
Arginine	89.1±19.0	95.3±18.5	0.279
Asparagine	40.8±8.3	43.1±7.0	0.311

Glutamate	20.9±4.5	27.9±7.4	<0.002*
Glutamine	513.1±48.5	445.8±50.6	<0.0004**

Isoleucine	53.6±11.5	62.2±14.5	0.033
Leucine	99.0±16.1	106.4±22.4	0.210
Lysine	155.3±28.5	164.2±32.5	0.332
Methionine	23.7±5.1	25.8±5.6	0.203
Ornithine	43.9±11.3	51.9±10.8	0.021
Phenylalanine	51.7±6.8	55.1±8.4	0.146
Proline	153.7±56.4	131.7±47.6	0.165
Serine	105.4±15.6	115.8±14.7	0.027
Taurine	33.4±5.5	37.8±7.9	0.036
Threonine	100.8±19.7	112.0±24.3	0.097
Tryptophan	44.8±5.6	47.3±6.4	0.167
Tyrosine	60.9±10.5	58.4±10.1	0.425
Urea	3976.3±818.7	3759.9±773.3	0.367
Valine	200.2±29.4	217.1±29.7	0.062

*C. Shimmura et al.
PLoSone October
2011 6(1):e25340

Symptoms of Adverse Reactions to MMR before and after 2002*

More Common Before 2002

Reaction	Count Before 2002	Count After 2002	p-value
joint pain	126	65	0.036

More Common After 2002

Reaction	Count Before 2002	Count After 2002	p-value
hospitalization	71	319	0.00037
seizures	203	1462	0.0014
shortness of breath	100	216	0.010
hives	324	504	0.011
mumps	5	51	0.014
abscess	51	120	0.022
autism	69	143	0.024
eczema	4	36	0.026
ear infection	16	56	0.031
anaphylactic shock	16	54	0.034
facial swelling	45	95	0.040
swelling	860	1018	0.048

*Data analyzed from the VAERS database

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Reaction	Count Before 2002	Count After 2002	p-value
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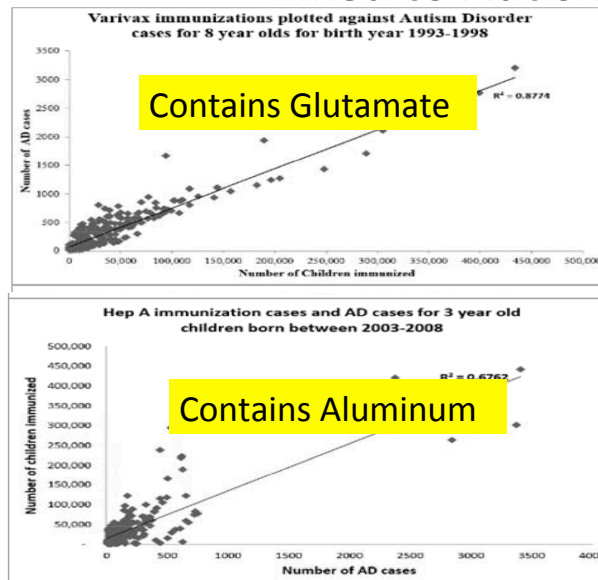
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eczema	4	36	0.026
ear infection	16	56	0.031
anaphylactic shock	16	54	0.034
Facial swelling	45	95	0.040
swelling	860	1018	0.048

These are all characteristic symptoms of allergies to MSG

*Data analyzed from the VAERS database

Varivax and Hepatitis A Vaccines: Linked to Autism*



*TA Deisher et al.,
Journal of Public Health
and Epidemiology 6(9),
271-284, 2014.

Recapitulation

- Glyphosate's inhibition of the shikimate pathway likely impairs melatonin synthesis
 - Leads to sleep disorder, associated with many diseases
- Pineal gland is highly susceptible to aluminum
- Glyphosate promotes aluminum entry past the gut and brain barriers and uptake by the cells
- Glyphosate also promotes glutamate toxicity due to manganese deficiency, leading to acute reaction to glutamate in MMR vaccine and other vaccines

Breast Cancer

Glyphosate is an endocrine disruptor that promotes breast cancer*

- Low and environmentally relevant concentrations of glyphosate possess estrogenic activity
- Glyphosate caused human hormone-dependent breast cancer cells to proliferate at concentrations of *parts per trillion*
- Additive effect from genistein, a phytoestrogen in soybeans



* S. Thongprakaisang et al., Food Chem Toxicol. 2013 Jun 8. S0278-6915(13)00363-3.

Glyphosate Causes DNA Damage and Cell Death at Extreme Dilutions

Arch Toxicol (2012) 86:805–813
DOI 10.1007/s00204-012-0804-8

GENOTOXICITY AND CARCINOGENICITY

Cytotoxic and DNA-damaging properties of glyphosate and Roundup in human-derived buccal epithelial cells

Verena J. Ko
Miroslav Mis

Received: 14 Se
© Springer-Verl

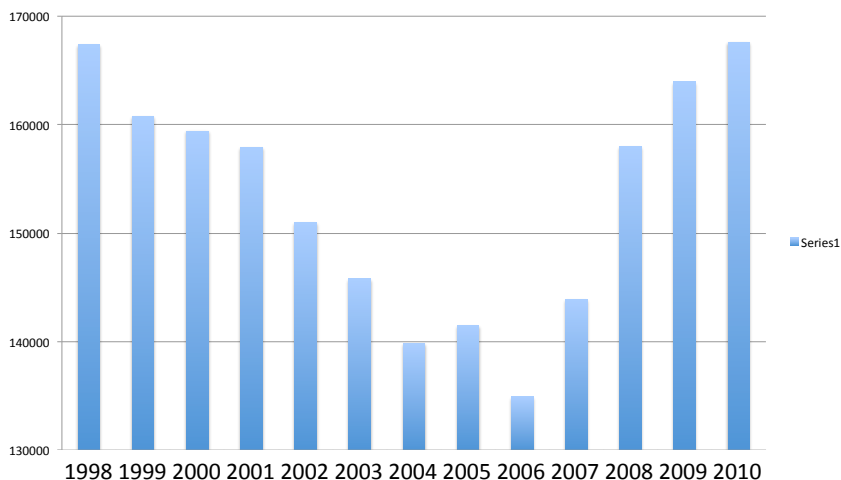
the herbicide and its formulation. Since we found genotoxic effects after short exposure to concentrations that correspond to a 450-fold dilution of spraying used in agriculture, our findings indicate that inhalation may cause DNA damage in exposed individuals.

Abstract Glyphosate (G) is the largest selling herbicide worldwide; the most common formulations (Roundup, R) contain polyoxyethyleneamine as main surfactant. Recent findings indicate that G exposure may cause DNA damage and cancer in humans. Aim of this investigation was to study the cytotoxic and genotoxic properties of G and R (UltraMax) in a buccal epithelial cell line (TR146), as

the herbicide and its formulation. Since we found genotoxic effects after short exposure to concentrations that correspond to a 450-fold dilution of spraying used in agriculture, our findings indicate that inhalation may cause DNA damage in exposed individuals.

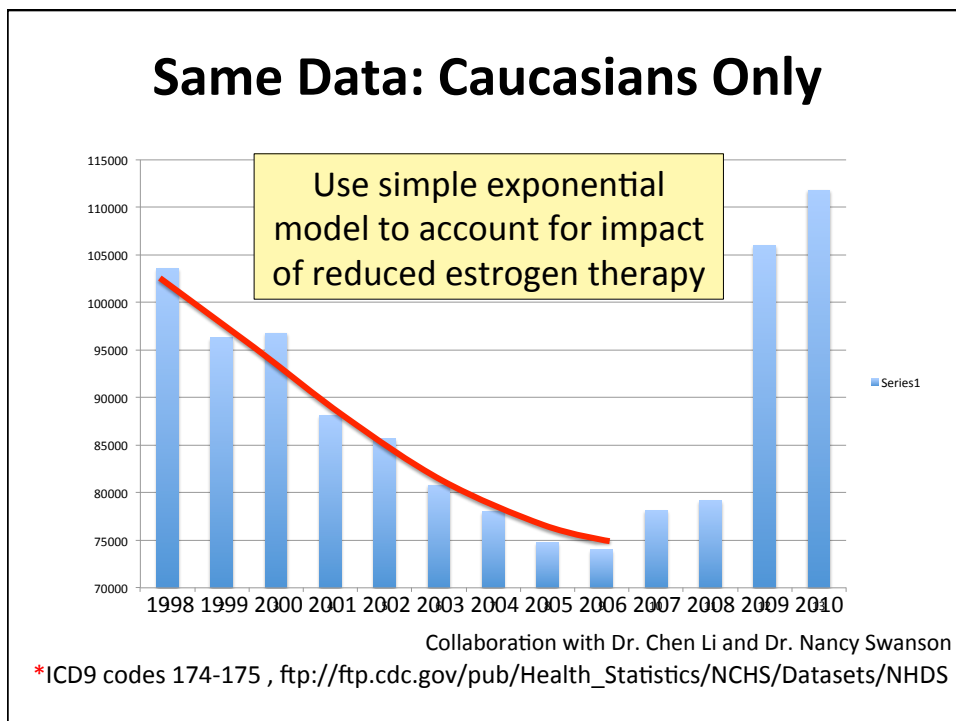
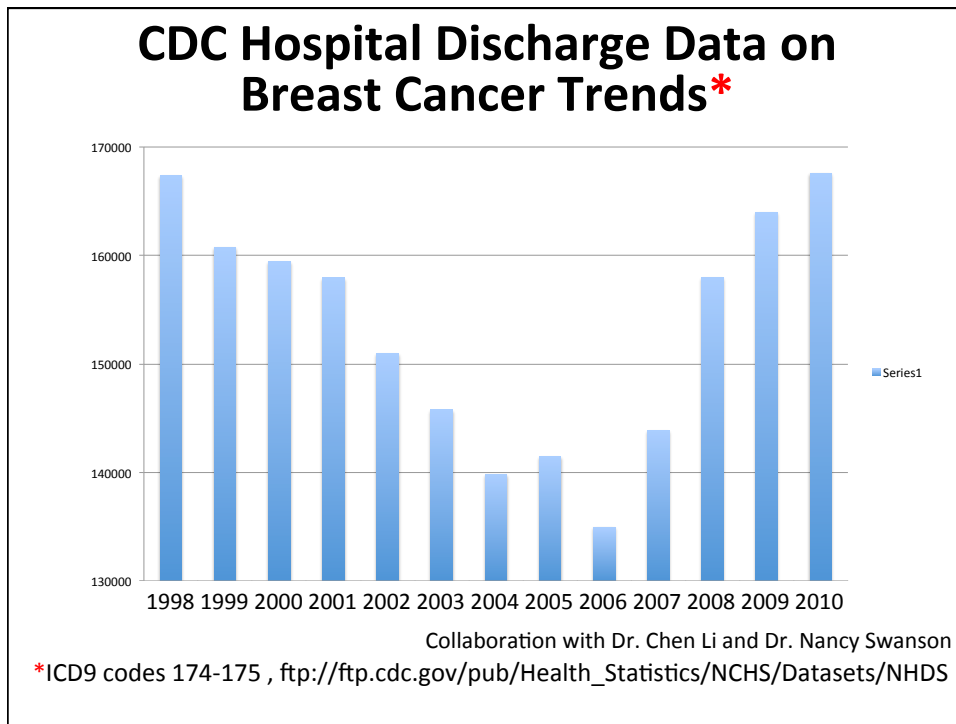
Keywords Glyphosate · Roundup · Cytotoxic ·

CDC Hospital Discharge Data on Breast Cancer Trends*



Collaboration with Dr. Chen Li and Dr. Nancy Swanson

*ICD9 codes 174-175, ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NHDS

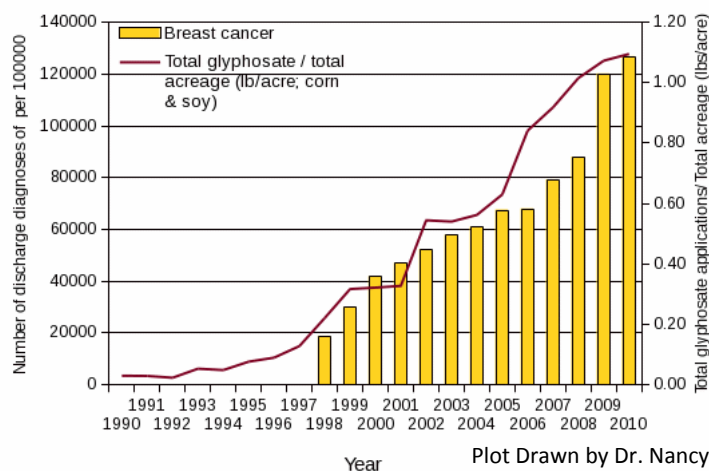


Once Estrogen Model Is Subtracted ...

Hospital Discharge Diagnoses of Breast Cancer
& Glyphosate applied to corn & soy crops

$R = 0.9375, p < 0.0001132$

Sources: CDC, USDA



*ICD9 codes 174-175 , ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NHDS

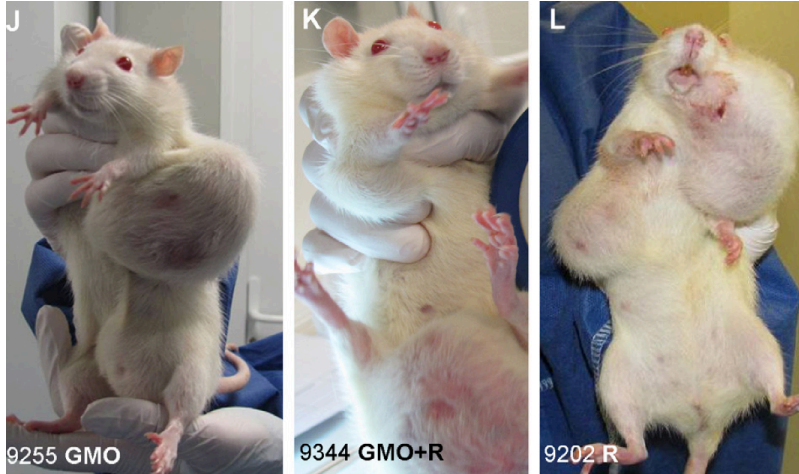
Roundup Disrupts Steroid Synthesis*

- StAR protein mediates rate-limiting step in steroid synthesis
- Roundup suppresses StAR protein by 90% and reduces steroidogenesis by 94%
- This affects both the production of sex hormones in the gonads and the production of cortisol and aldosterone in the adrenal glands

*L.P. Walsh et al., Environmental Health Perspectives 108(8), 2000 769-776.

Mammary Tumors in Rats*

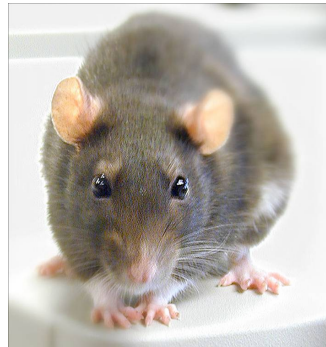
Rats through their entire lifespan exposed to Roundup at levels well below established safety limits



*G-E Séralini et al. Environmental Sciences Europe 2014, 26:14

Conclusions from Rat Study *

- *Female rats had greatly increased risk of mammary tumors*
- Males had significantly increased risk of liver and kidney disease
- Sex hormone disruption for both males and females
- Enhanced oxidative stress
- Shorter life span
- *Effects didn't become apparent until after 4 months*



*G-E Séralini et al. Environmental Sciences Europe 2014, 26:14

Chondroitin Sulfate and the Skeleton

Glyphosate and Bone Development*

- Dams treated with glyphosate in water from days 6 to 15 of their pregnancy
- Effects on pups:
 - Lack of development of the ossification centers of the terminal phalanges (bones in fingers and toes)
 - Larger fontanelles ("soft spot") and incomplete development of skull bones
 - Absence of important bones or parts of bones, shortenings, bendings, asymmetry, fusions or clefts.
 - Surfactant polyoxyethyleneamine increased glyphosate's toxicity



*E. Dallegrave et al. Toxicology Letters 142 (2003) 45-52.

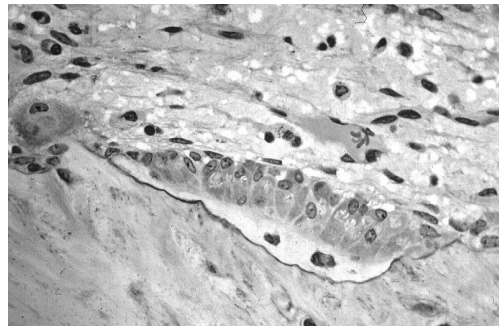
Manganese and Bones*

“The multiple cellular effects of Mn deficiency include: decreased bone resorption, production of labile bone, and *decreased synthesis of organic matrix*. The serum level of Mn in a group of osteoporotic postmenopausal women was significantly lower than age-matched controls.”

*L. Strause and P. Saltman. Role of Manganese in Bone Metabolism. Chapter 5, pp 46–55 in Nutritional Bioavailability of Manganese.

Osteoblasts build “Ground Substance”

- Ground substance is made of chondroitin sulfate and osteocalcin – collagen is layered over this
- Poor mineralization results from impaired chondroitin sulfate synthesis

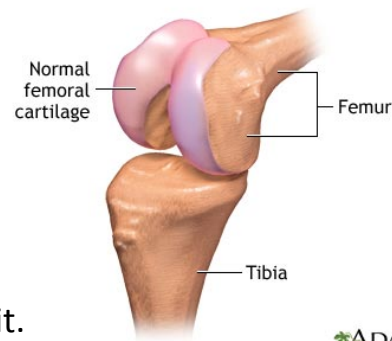


Osteoblasts in bone

Childhood osteoarthritis and osteomalacia are an epidemic in the US today

Chondroitin Sulfate Synthesis in Cartilage depends on Manganese*

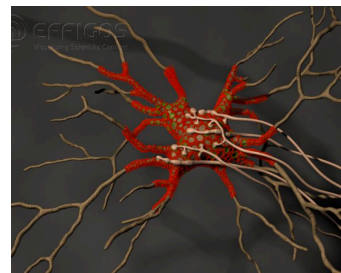
- Two critical enzymes are manganese dependent:
 - Polymerase enzyme forms the polysaccharide
 - Galactotransferase incorporates galactose that links the polysaccharide to the protein associated with it.



*RM Leach et al. Archives of Biochemistry and Biophysics 133(1), 1969, 22-28.

Perineuronal Nets*

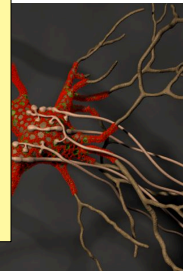
- Perineuronal nets (PNs) formed from *chondroitin sulfate* attached to hyaluronan, modulate GABAergic inhibitory signaling
- Removal of PNs increased excitability of interneurons in cultures
- They provide an environment rich in anions (negative charge)



*G. Bruckner et al. Glia 8(3), 183-200, 1993.

Perineuronal Nets*

- Perineuronal nets (PNs) formed from *chondroitin sulfate* attached to hyaluronan, mo
- Re Might manganese deficiency lead to impaired synthesis of perineuronal nets and increased neuronal excitability leading to cell death??
- Th rich in anions (negative charge)



*G. Bruckner et al. Glia 8(3), 183-200, 1993.

Coral Die-Off & Chondroitin Sulfate*

- Large amounts of chondroitin sulfate are adsorbed onto coral
- Sulfate groups are of paramount importance to the adsorption process
- Adsorption rate is a direct function of the amount of negative charge



*N. Volpi. Biomaterials 2002 Jul;23(14):3015-22

“Disease Causes Starfish to Lose Arms, Dissolve into White Blobs of Goo” *

- Glyphosate is used to kill seagrass in oyster beds
- "Glyphosate and diuron are among the most frequently detected herbicides in oyster production areas" **
- Starfish eat oysters



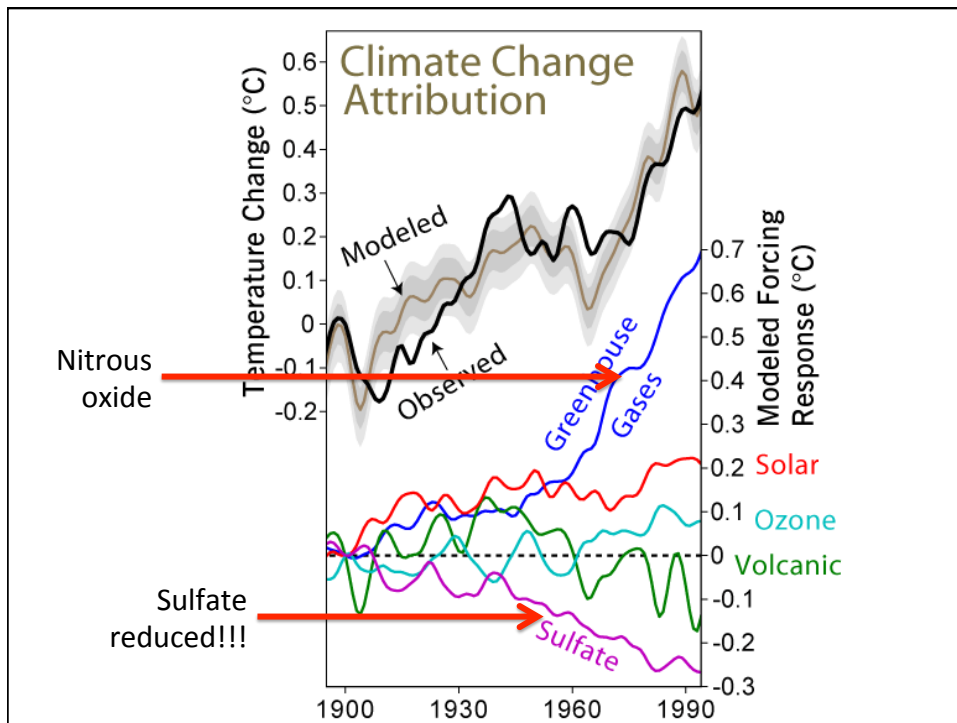
*<http://natureworldnews.com/articles/4749/20131104/disease-causes-starfish-lose-arms-dissolve-white-blobs-goo-video.htm>

**F. Akcha et al. Aquatic Toxicology. 106-107 (pp 104-113), 2012

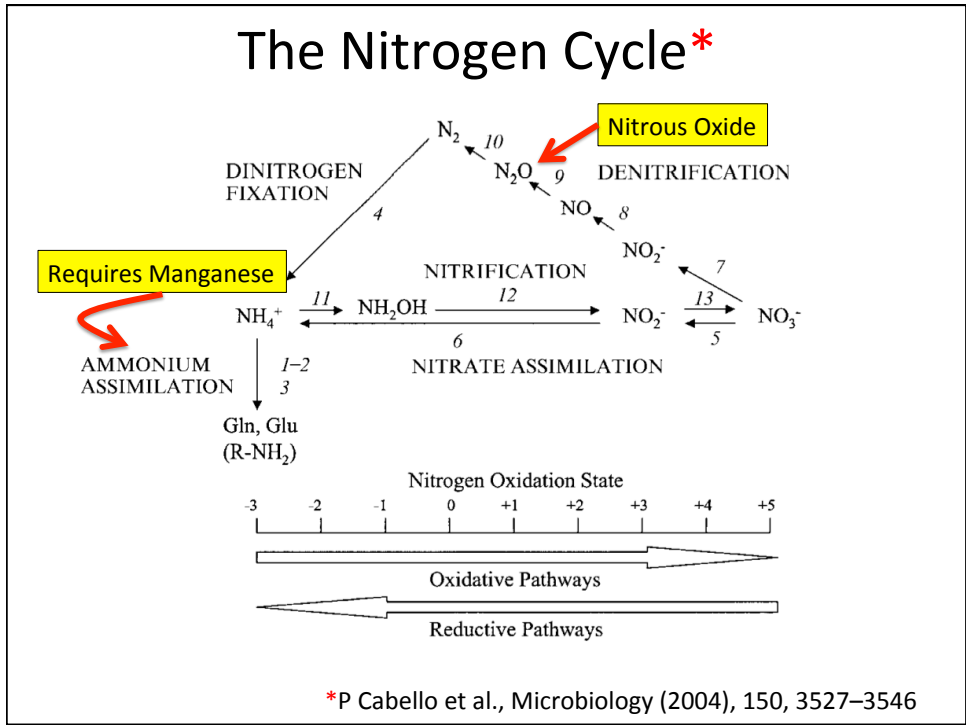
Recapitulation

- Manganese deficiency due to defects in chondroitin sulfate causes impaired bone development and defective perineuronal nets
 - Explains epidemic in osteomalacia and osteoporosis
 - Offers hypothesis for neuronal cell death
 - Explains joint issues related to defective cartilage
- Manganese deficiency due to glyphosate exposure may explain the recent diseases in coral and starfish

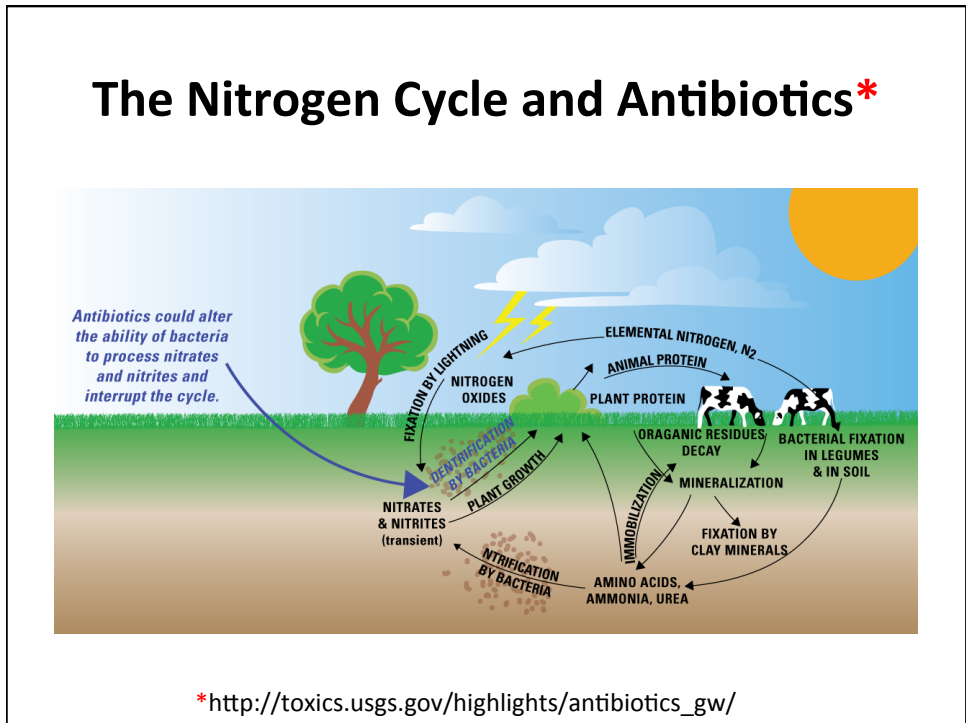
Glyphosate and Climate Change



The Nitrogen Cycle*

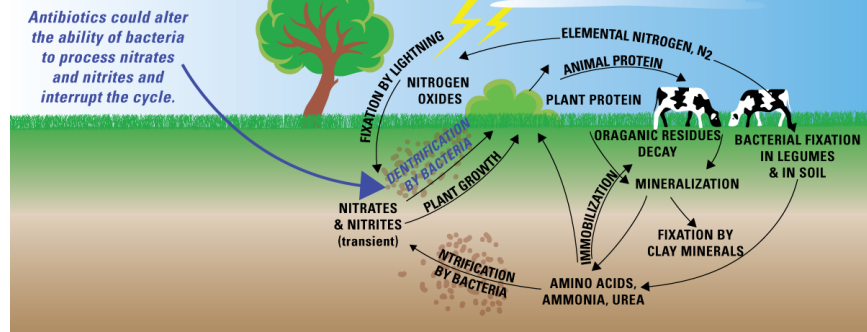


The Nitrogen Cycle and Antibiotics*



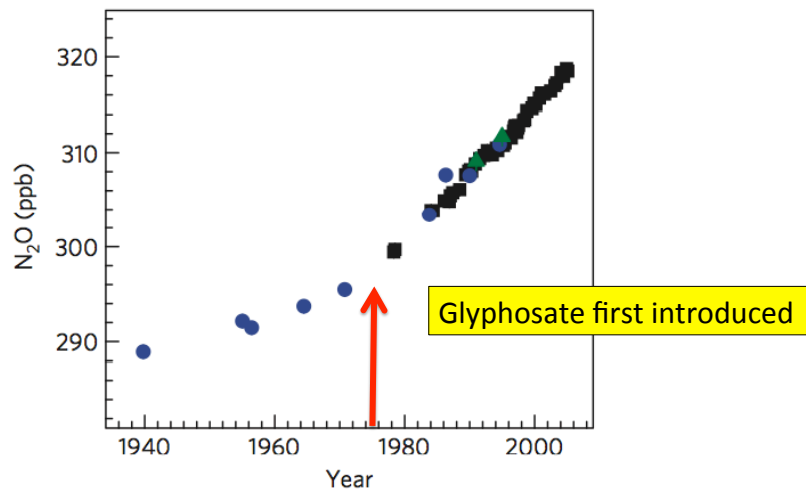
The Nitrogen Cycle and Antibiotics*

Glyphosate is a patented antimicrobial agent



*http://toxics.usgs.gov/highlights/antibiotics_gw/

Nitrous Oxide Levels Over Time*



*S Park et al., Nature Geoscience 2012; 5: 261-265.

Two Quotes from the Paper*

"This result confirms that the increase in the atmospheric N₂O burden is largely due to *nitrogen-based agricultural fertilizer use.*"

"Given that nitrous oxide is both a long-lived greenhouse gas and a stratospheric ozone-depleting substance, this increase is of global concern."

*S Park et al., Nature Geoscience 2012; 5: 261-265.

Algal blooms and Dead Zones

Algal blooms in lakes due to runoff from farmlands with excess phosphate fertilizers lead to anaerobic "dead zone" at depth where nitrous oxide is produced in abundance

*P Cabello et al., Microbiology (2004), 150, 3527–3546

Nitrates and Public Health*

- Excess nitrogen oxides in drinking water can cause methemoglobinemia, leading to lysis of red blood cells and oxygen deprivation in infants
- If left untreated, it can result in “confusion, cyanosis, imbalance, hemodynamic instability, coma, and death.”
- Important newly recognized source is *nitrogen-reducing gut microbes* that proliferate during acute gastrointestinal infection

*Richard et al., The Ochsner Journal, 14:2392-398,2014

Glyphosate, Oxalate and Anemia

Autism Linked to Oxalate Crystals*

- Crystals of oxalate form kidney stones and cause great discomfort
- Study has shown at least 3-fold higher serum and urinary levels of oxalate in autistic kids**



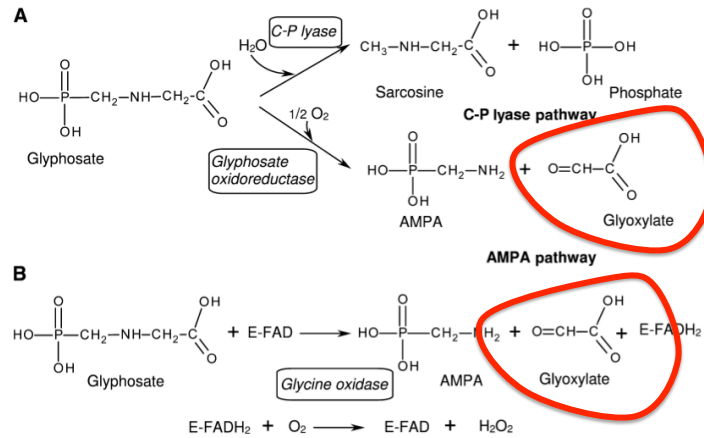
*William Shaw, The Role of Oxalates in Autism and Chronic Disorders WAPF, March 26, 2010

**J Konstantynowicz et al., European Journal of Paediatric Neurology 16(5), 2012, 485-491.

“Cerebral edema, and perhaps injury to other organs, could result from oxalate crystal deposition in small blood vessels in the brain and other organs.”*

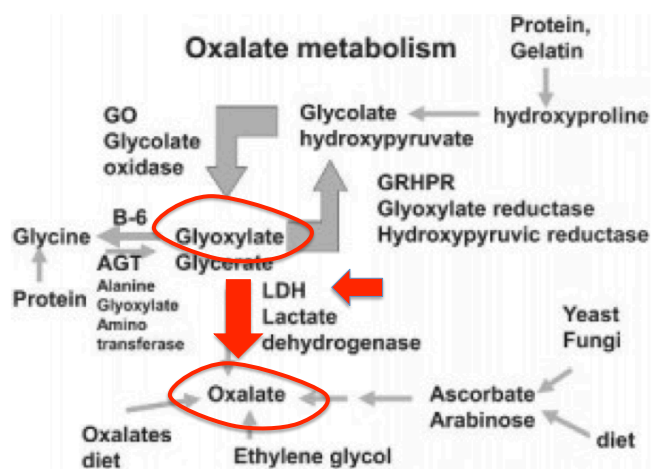
*K Froberg et al., Clin Toxicol (Phila). 2006;44(3):315-8.

Glyphosate Metabolism*



*Figure 3 in L. Polligioni et al., FEBS Journal 278 (2011) 2753–2766

Oxalate Metabolism*



*<http://www.greatplainslaboratory.com/home/eng/oxalates.asp>

Oxalate Suppresses Lactate Dehydrogenase

- Lactate dehydrogenase converts pyruvate to lactate, but also converts glyoxylate to oxalate
- Oxalate suppresses its activity*
- Glyphosate was also shown to suppress its activity by 3-fold in studies on E coli**

*RJS Duncan et al., European J. Biochem. 11 (1969) 58-61.

**W Lu et al., Mol. BioSyst 2012;9:522-530.

Hypothesis: flooding with oxalate prevents metabolism of glyoxylate to oxalate. Glyoxylate is a very potent glycating agent, leading to widespread damage. This also inhibits glyphosate breakdown to glyoxylate.

Monsanto Patents: 2002-2010: Pesticide Compositions Containing Oxalic Acid

“[origin: WO02069718A2] Pesticidal concentrate and spray compositions are described which exhibit *enhanced efficacy* ... More particularly, the present invention relates to a method of enhancing the herbicidal effectiveness of *glyphosate* concentrate and tank mix formulations containing one or more surfactants through the addition of *oxalic acid*.”



(12) **United States Patent** (10) **Patent No.:** **US 7,723,265 B2**
 Xu et al. (45) **Date of Patent:** ***May 25, 2010**

**Monsanto Technology,
St. Louis, MO**

(54) PESTICIDE COMPOSITIONS CONTAINING OXALIC ACID (75) Inventors: Xiaodong C. Xu , Valley Park, MO (US); Ronald J. Brinker , Ellisville, MO (US); Tracey L. Reynolds , Ballwin, MO (US); William Abraham , Wildwood, MO (US); Jeffrey A. Graham , Wildwood, MO (US) (73) Assignee: Monsanto Technology , St. Louis, MO (US)	4,140,513 A 2/1979 Prill 4,159,901 A 7/1979 Boettman et al. 4,161,590 A 7/1979 Mueller 4,161,602 A 7/1979 Mueller 4,215,765 A 2/1982 Lange 4,405,531 A 9/1983 Franz 4,431,765 A 2/1984 Doshak et al. 4,481,026 A 11/1984 Pristylis 4,507,250 A 3/1985 Bakel 4,936,901 A 6/1990 Sargan, Sr. et al. 5,118,444 A 6/1992 Nguyen 5,317,003 A 5/1994 Kassebaum et al.
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Oxalic acid and oxalate are the same thing!

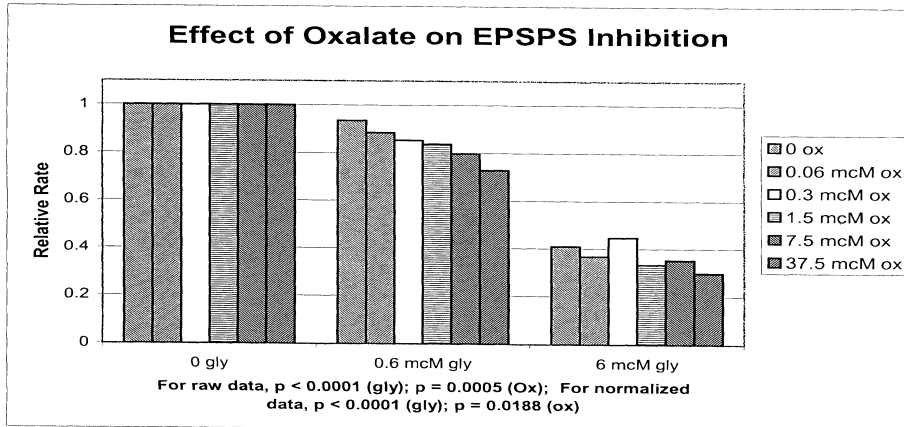


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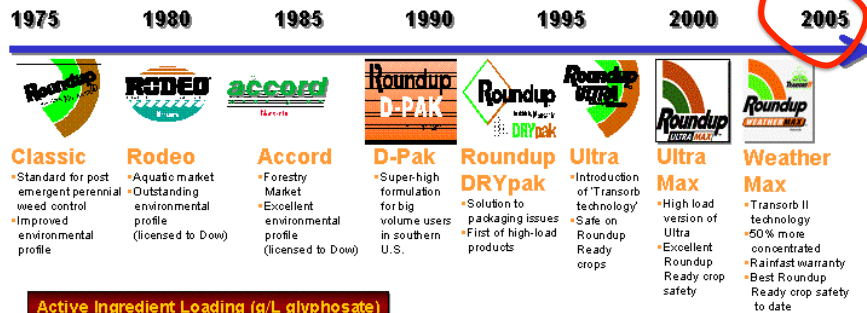
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Oxalate Enhances Glyphosate's Toxicity to Plants at Small Concentrations*

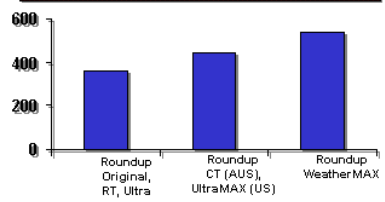


*Figure 1, Monsanto Patent #US 7,771,736 B2, Aug. 10, 2010

Roundup Brand Leadership Driven by Continuous Innovation



Active Ingredient Loading (g/L glyphosate)

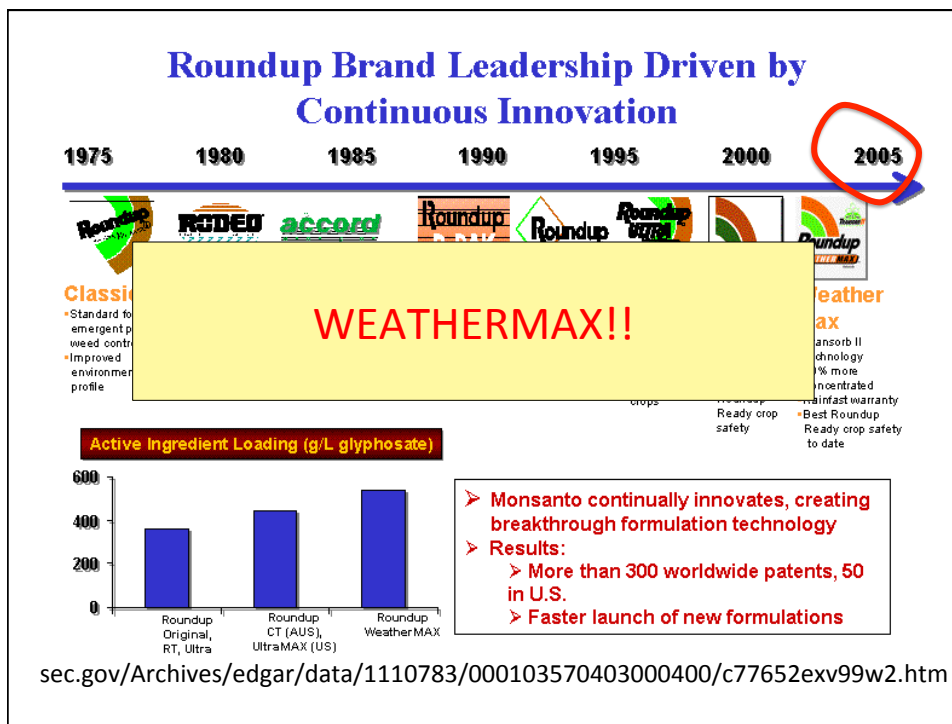


➤ Monsanto continually innovates, creating breakthrough formulation technology

➤ Results:

- More than 300 worldwide patents, 50 in U.S.
- Faster launch of new formulations

sec.gov/Archives/edgar/data/1110783/000103570403000400/c77652exv99w2.htm

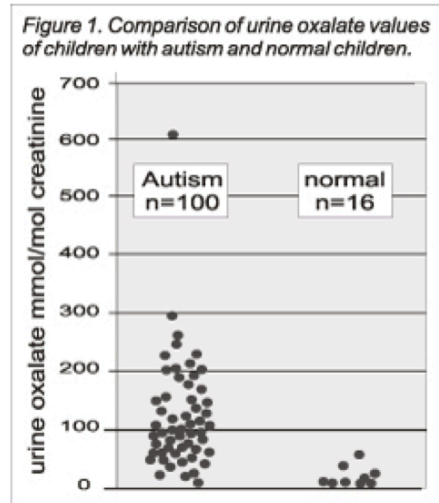


New Roundup Transorb'R' Herbicide Formulation to Hit Retail Shelves in Eastern Canada*

“In 2004, this powerful new formulation was chosen by more western Canadian growers than any other non-selective herbicide on the market. Grower satisfaction with the performance in the field has reached new heights - 99% of growers who used Roundup *WeatherMAX* were satisfied with their experience.”

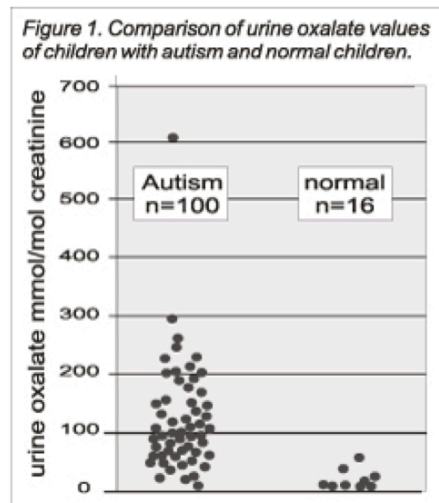
*www.highbeam.com/doc/1P2-13686824.html
 JANUARY 3, 2005

“Oxalate crystals in the bone may crowd out the bone marrow cells, leading to anemia and immunosuppression”*

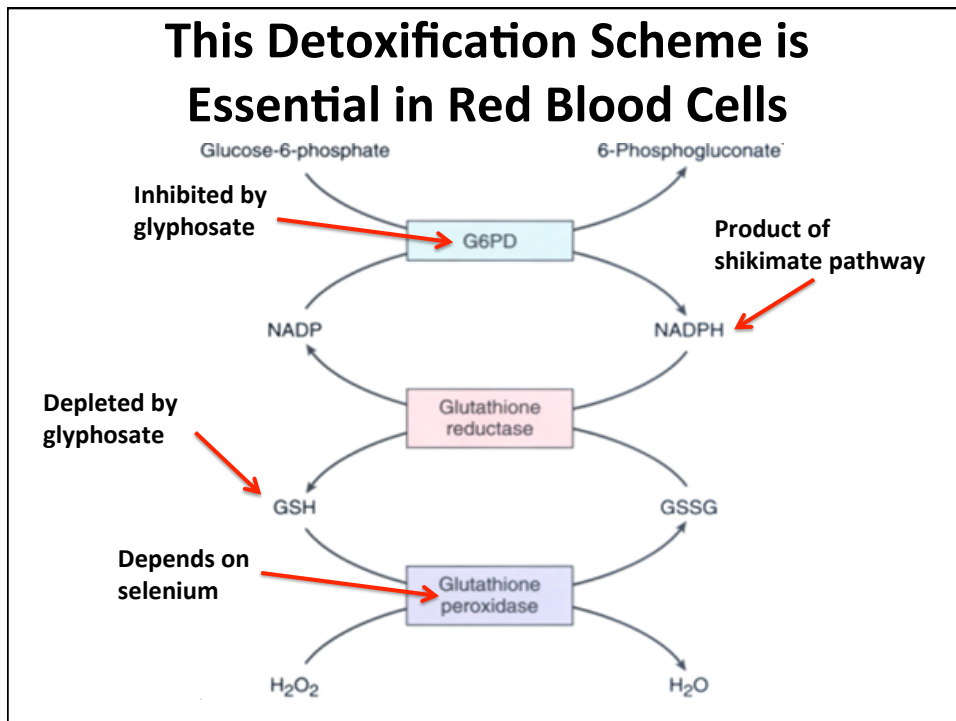
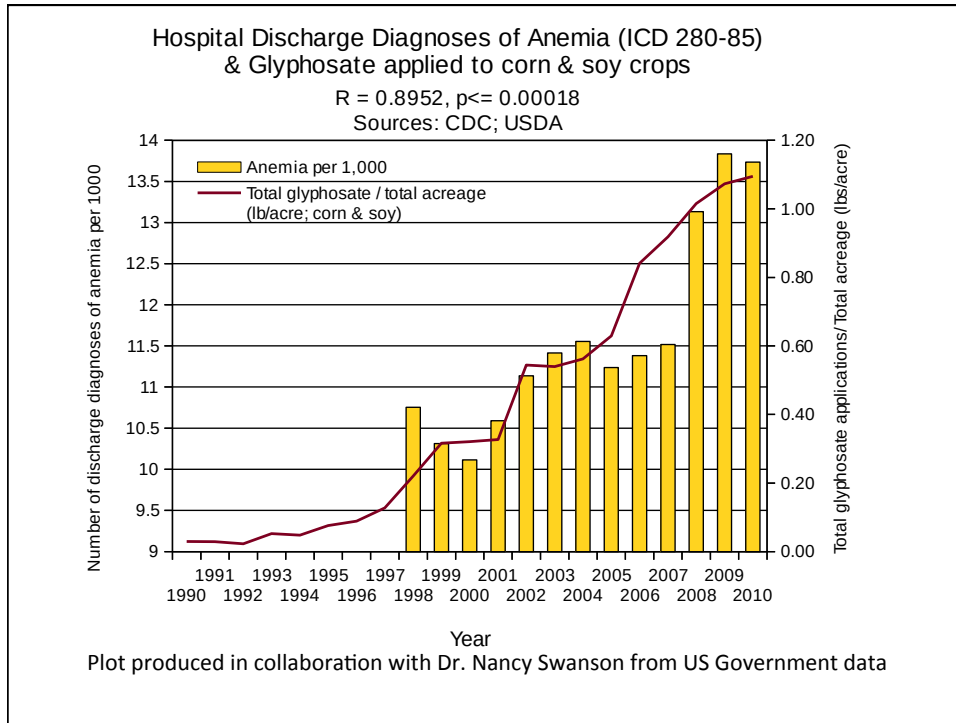


*<http://www.greatplainslaboratory.com/home/span/oxalates.asp>

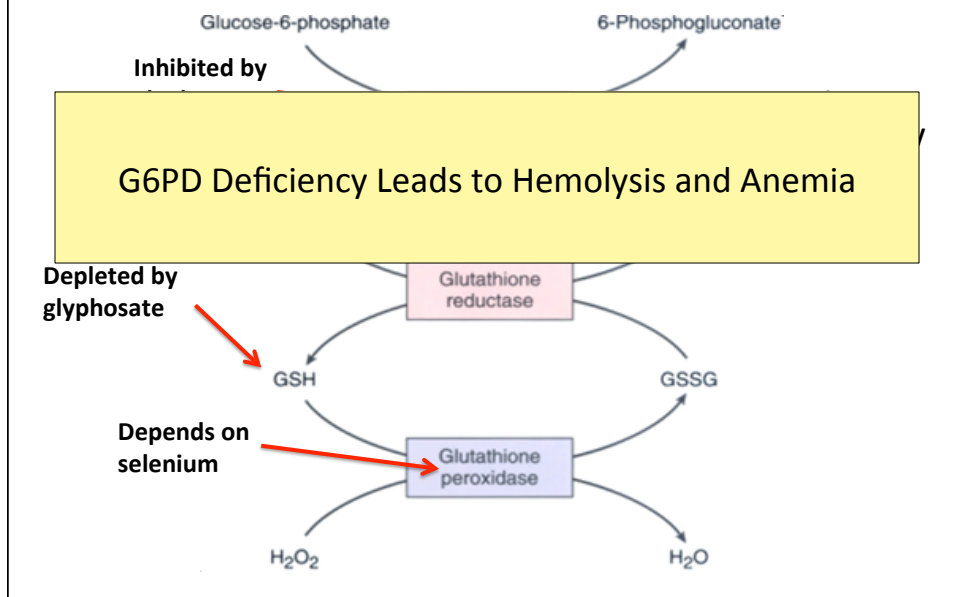
“Oxalate crystals in the bone may crowd out the bone marrow cells, leading to **anemia and immunosuppression”***



*<http://www.greatplainslaboratory.com/home/span/oxalates.asp>



This Detoxification Scheme is Essential in Red Blood Cells



Anemia leads to low oxygen which induces chronic low grade encephalopathy linked to autism

Entropy **2013**, *15*, 372–406; doi:10.3390/e15010372

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entropy

ISSN 1099-4300

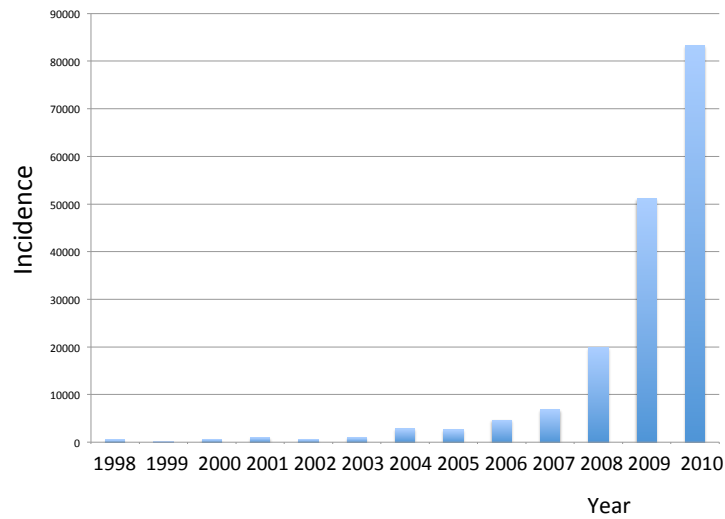
www.mdpi.com/journal/entropy

Review

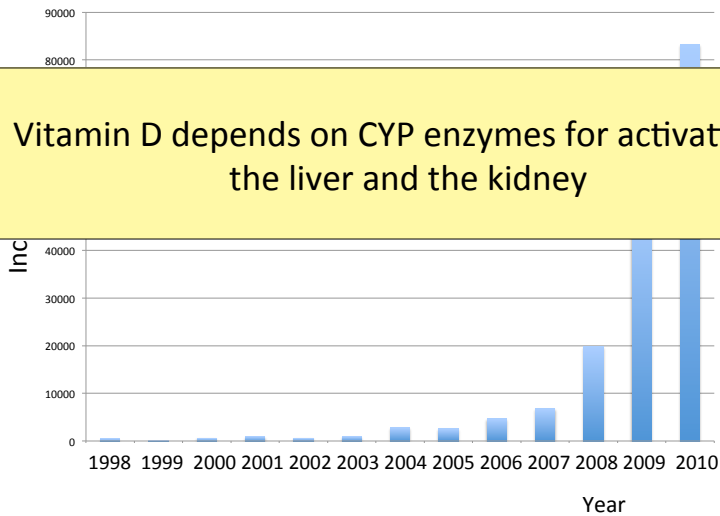
Is Encephalopathy a Mechanism to Renew Sulfate in Autism?

Stephanie Seneff ^{1,*}, Ann Lauritzen ², Robert M. Davidson ³ and Laurie Lentz-Marino ⁴

Vitamin D Deficiency Epidemic

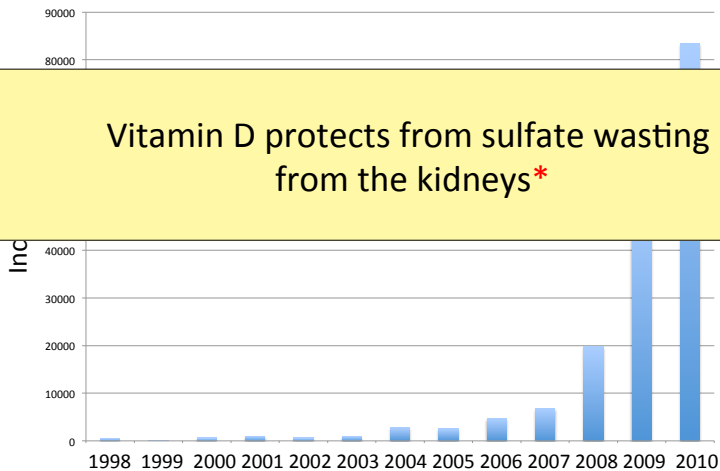


Vitamin D Deficiency Epidemic



Vitamin D depends on CYP enzymes for activation in the liver and the kidney

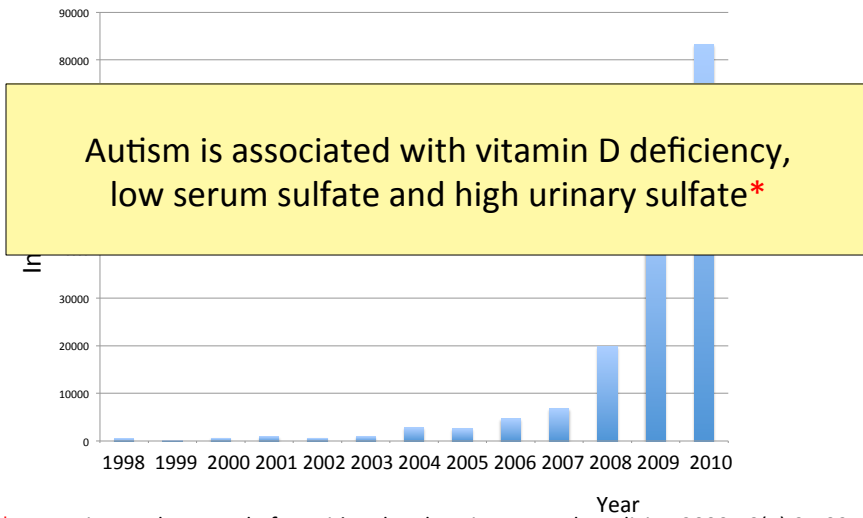
Vitamin D Deficiency Epidemic



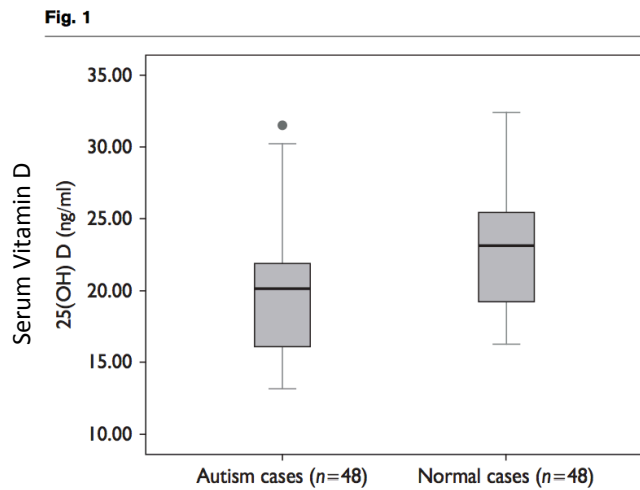
Vitamin D protects from sulfate wasting from the kidneys*

*MJG Bolt et al., American Journal of Physiology - Endocrinology and Metabolism 2004;287(4):E744-E749.

Vitamin D Deficiency Epidemic



Recent Study from China*



*Z-L Gong et al., NeuroReport 2014, 25:23-27

Recapitulation

- Glyphosate induces anemia and iron toxicity by disrupting red blood cells
 - Anemia induces hypoxia and low grade encephalopathy
- New formulation, WeatherMax, introduced in 2005, is more toxic to both plants and animals
 - Likely contains oxalate that suppresses glyphosate detoxification
 - High serum oxalate is linked to autism
- Vitamin D deficiency epidemic post 2005 may be caused by disruption of liver CYP enzymes
 - This will lead to sulfate deficiency due to wasting at kidneys

Summary

- Glyphosate contamination in our food supply is a serious threat to human health
- Glyphosate is implicated in autism, breast cancer, Celiac disease, vitamin D deficiency, sleep disorders, osteoarthritis and many other health issues
- Suspected addition of oxalate to the formulation in 2005 led to significant increases in toxicity to both plants and animals
- Iron dysbiosis and anemia are important factors
- Glyphosate may be working synergistically with vaccine ingredients to cause increased harm
- Glyphosate may play a significant role in climate change



Thank You!