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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.


Percentage of children with Autism in the US
Percentage of children with Autism in the US

Half the children born in 2032 will be diagnosed with autism

“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

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
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
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

*Samuel 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

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

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

Glyphosate Depletes Iron, Manganese and Zinc in Plants*


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.”


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.”

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.
Paper Recently Published


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

Nancy L. Swanson¹, Andre Leu², Jon Abrahamson³ and Bradley Walle⁴

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.al@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
Wheat! Not corn and soy!
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

Glyphosate and Autism

New Study*

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

Cynthia D Neison

• 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. Neison Environmental Health 2014;13:73.
Autism Prevalence: 6 year olds

glyphosate is total of year indicated + 3 previous years

R = 0.9972, p <= 2.366e-07

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*Plot provided by Nancy Swanson, with permission

Data sources: autism: US Department of Education; Glyphosate: US Department of Agriculture

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*Plot provided by Nancy Swanson, with permission

Data sources: autism: US Department of Education; Glyphosate: US Department of Agriculture
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
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


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./Bioclectrochemistry 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 \(\rightarrow\) 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

Glyphosate application to corn and soy, US

Children with Autism, US

# Adverse Reactions in VAERS

Is this steep rise linked to the introduction of WeatherMax?
Stay tuned...

Glyphosate makes the aluminum (and mercury?) (and glutamate??) in vaccines much more toxic??

*Collaboration with Dr. Nancy Swanson
Glyphosate enhances aluminum toxicity

Glyphosate interferes with acetaminophen metabolism

* Glyphosate* enhances aluminum toxicity

* Glyphosate interferes with acetaminophen metabolism

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

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

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

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!

Glutamine synthetase

Glutamate Detoxification Depends on Manganese!

Glutamine synthetase

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”*

<table>
<thead>
<tr>
<th>Amino acid</th>
<th>Control</th>
<th>HFA</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutamate</td>
<td>20.9±4.5</td>
<td>27.9±7.4</td>
<td>&lt;0.002*</td>
</tr>
<tr>
<td>Glutamine</td>
<td>513.1±48.5</td>
<td>445.8±50.6</td>
<td>&lt;0.0004**</td>
</tr>
</tbody>
</table>

### Symptoms of Adverse Reactions to MMR before and after 2002*

**More Common Before 2002**

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Count Before 2002</th>
<th>Count After 2002</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>joint pain</td>
<td>126</td>
<td>65</td>
<td>0.036</td>
</tr>
</tbody>
</table>

**More Common After 2002**

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Count Before 2002</th>
<th>Count After 2002</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>hospitalization</td>
<td>71</td>
<td>319</td>
<td>0.00037</td>
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<tr>
<td>seizures</td>
<td>203</td>
<td>462</td>
<td>0.0014</td>
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<tr>
<td>shortness of breath</td>
<td>100</td>
<td>216</td>
<td>0.010</td>
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<tr>
<td>hives</td>
<td>324</td>
<td>504</td>
<td>0.011</td>
</tr>
<tr>
<td>mumps</td>
<td>5</td>
<td>51</td>
<td>0.014</td>
</tr>
<tr>
<td>abscess</td>
<td>51</td>
<td>120</td>
<td>0.022</td>
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<tr>
<td>autism</td>
<td>69</td>
<td>143</td>
<td>0.024</td>
</tr>
<tr>
<td>eczema</td>
<td>4</td>
<td>36</td>
<td>0.026</td>
</tr>
<tr>
<td>ear infection</td>
<td>16</td>
<td>54</td>
<td>0.034</td>
</tr>
<tr>
<td>anaphylactic shock</td>
<td>45</td>
<td>95</td>
<td>0.040</td>
</tr>
<tr>
<td>swelling</td>
<td>860</td>
<td>1018</td>
<td>0.048</td>
</tr>
</tbody>
</table>

*Data analyzed from the VAERS database

#### These are all characteristic symptoms of allergies to MSG

- Seizures
- Hives
- Swelling
- Facial swelling
- Swelling
- Eczema

*Data analyzed from the VAERS database*
Varivax and Hepatitis A Vaccines: Linked to Autism*


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
**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

Glyphosate Causes DNA Damage and Cell Death at Extreme Dilutions

Glyphosate (G) is the largest selling herbicide worldwide; the most common formulations (Roundup, R) contain polyoxyethyleneurea 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

CDC Hospital Discharge Data on Breast Cancer Trends*

Collaboration with Dr. Chen Li and Dr. Nancy Swanson


Same Data: Caucasians Only

Use simple exponential model to account for impact of reduced estrogen therapy

Collaboration with Dr. Chen Li and Dr. Nancy Swanson

Once Estrogen Model Is Subtracted ...

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

*R = 0.9375, p < 0.000112
Sources: CDC, USDA

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

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

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.”


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

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.


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)

Perineuronal Nets*

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


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.

“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

**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

![Graph showing climate change attribution with marked contributions from Nitrous oxide and Sulfate reduced.](image)
The Nitrogen Cycle*

 Requires Manganese

 Nitrous Oxide

 The Nitrogen Cycle and Antibiotics*

 *http://toxics.usgs.gov/highlights/antibiotics_gw/
The Nitrogen Cycle and Antibiotics*

Glyphosate is a patented antimicrobial agent

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

Nitrous Oxide Levels Over Time*

* Glyphosate first introduced

Two Quotes from the Paper*

"This result confirms that the increase in the atmospheric N$_2$O burden is largely due to \textit{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.”


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


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

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**


**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.”

Oxalic acid and oxalate are the same thing!
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

- 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
WEATHERMAX!!

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
Hospital Discharge Diagnoses of Anemia (ICD 280-85) & Glyphosate applied to corn & soy crops

$R = 0.8952, p<= 0.00018$  
Sources: CDC; USDA

This Detoxification Scheme is Essential in Red Blood Cells

- Inhibited by glyphosate
- Product of shikimate pathway
- Depleted by glyphosate
- Depends on selenium
This Detoxification Scheme is Essential in Red Blood Cells

G6PD Deficiency Leads to Hemolysis and Anemia

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

Is Encephalopathy a Mechanism to Renew Sulfate in Autism?

Stephanie Seneff 1a, 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*

Vitamin D Deficiency Epidemic

*Autism is associated with vitamin D deficiency, low serum sulfate and high urinary sulfate*

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
One Final Message:
Go Organic!

Thank You!