Roundup and GMOs: Are we gambling with the future of food?

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“There are three things that can’t be long hidden: the sun, the moon and the truth”
--Buddha
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.

Prevalence of autism in US children (%)

Study publication date


1 in 5,000 1 in 2,500 1 in 150 1 in 166 1 in 500 1 in 110 1 in 68

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

Glyphosate and Autism
草甘膦和自閉症
Autism Prevalence: 6 year olds

glyphosate is total of year indicated + 3 previous years
\[ R = 0.9972, \ p \leq 2.366e-07 \]

\[ R = 0.9972 \]

*Plot provided by Nancy Swanson, with permission

Data sources: autism: US Department of Education; Glyphosate: US Department of Agriculture
Autism Prevalence: 6 year olds

U.S. Market is 25% of World Market of Roundup

*Plot provided by Nancy Swanson, with permission

Data sources: autism: US Department of Education; Glyphosate: US Department of Agriculture
Glyphosate vs. Other Pesticides

Percent of Acres Treated with Pesticides

Corn, Cotton, & Soy

% all herbicides
% all Insecticides
% glyphosate

% of acres treated: 0 to 100

Year: 1990 to 2010

A Brief History of Glyphosate

• Glyphosate is the active ingredient in the pervasive herbicide, Roundup®
• GMO “Roundup Ready” soy, corn, canola, sugar beets, cotton, tobacco and alfalfa
  – Plants soak up the glyphosate and don’t die
• Roundup-Ready crops → Roundup-Ready weeds
• Monsanto assures regulatory bodies that glyphosate is practically nontoxic to humans
  – Disrupts shikimate pathway which our cells don’t have
• Very little monitoring of glyphosate levels in food
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 Toxic Effects of Glyphosate*

- Kills beneficial gut bacteria and allows pathogens to overgrow
- 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
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.”

Okay, It’s toxic!
But are we exposed?

Very little data!
Autism and Pesticide Exposure during Pregnancy*

“In general, exposure during the third trimester appeared to be riskiest, and odds of having a child with autism went up the closer the family had been living to the pesticide application, suggesting that doses got higher the nearer women were to the chemicals.”

Glyphosate in Air and Rain*

- Study conducted by the US Geological Survey in Mississippi
- 18-fold increase in glyphosate application since 1995

Glyphosate was the predominant new herbicide detected in both air (86%) and rain (77%) in 2007 (not measured in 1995)

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*
“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).
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 iron 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

*A Samsel and S Seneff, Entropy 2013, 15, 1416-1463
Dementia (痴呆症) 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
Digestive System Disorders
Gut Microbes and Obesity

- Our microbes outnumber our own cells 10 to 1.
- There are between 200 and 300 different species in a typical person.
- Glyphosate causes a loss of beneficial bacteria and an overgrowth of pathogens in the gut.
  - Pathogens release toxic phenols (e.g., p-cresol)
  - This can lead to inflammatory bowel disease
    - And a direct path to obesity!
- Gut microbes from an obese person induced obesity in mice*

Obesity in US over Time*

*Figure 1 in R.J. Johnson et al., Am J Clin Nutr 2007;86:899–906.

Glyphosate was introduced into the food chain in 1975
Pigs Fed GMOs Develop Inflamed Gut*

- Blind autopsies conducted
  - Female pigs' uterus 25% larger in GMO-fed pigs
  - Female pigs 2.2x more likely to get severe stomach inflammation on GMO diet
  - Males were 4x more likely

Photos kindly provided by Howard Vlieger

Human Digestive System Disorders

• Alarming increase in the US in many diseases related to the gut
  – Crohn’s disease, inflammatory bowel disease, colitis, acid reflux disease, gluten and casein intolerance, celiac disease, leaky gut

• The gut-brain axis links neurological disorders with gut disorders

• I believe that glyphosate is a major cause
CHECK OUT OUR NEW GLUTEN FREE AISLE!
Celiac Disease has Quadrupled in the US in the Last 50 Years
Wheat! Not corn and soy!

Graph provided by Nancy Swanson, with permission
Why is glyphosate usage on wheat going up?
“Herbicide Resistant Ryegrass Troubling for Wheat Growers”*

“If you see ryegrass at harvest following an Axial XL application, it may be resistant. And you can scatter seed all over the field with the combine.”

“A reduced-tillage approach, using a *burndown herbicide* ahead of planting in a stale seedbed, also holds promise for improved control.”

“‘We may be able to knock out 80% to 90% of the resistant ryegrass with glyphosate.’”

-- Jim Swart, integrated pest management specialist

*Ron Smith, Western Farm Press, Mar. 23, 2013*
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

REVIEW ARTICLE

Glyphosate, pathways to modern diseases II: Celiac sprue and gluten intolerance

Anthony SAMSEL ¹ and Stephanie SENEFF ²
Celiac Disease, Glyphosate and Non-Hodgkin’s Lymphoma

• Bifidobacteria are depleted in celiac disease*
  – They convert gluten to less toxic form
• Glyphosate preferentially kills bifidobacteria**
• Celiac disease is associated with increased risk to non-Hodgkin’s lymphoma***
• Glyphosate itself is also linked directly to non-Hodgkin’s lymphoma****

****M. Eriksson et al., Int J Cancer. 2008 Oct 1;123(7):1657-63.
“Dramatic Increase in Hospitalization of US Children With Inflammatory Bowel Disease”*

- Study conducted at Case Western Reserve University School of Medicine
- > 11 Million hospitalization records examined
- Patients < 20 years old
  - 49% increase from 2000 to 2009 in Crohn’s disease discharges
  - 71% increase in ulcerative colitis discharges

* Science Daily, June 25, 2013
Age Adjusted Deaths due to Intestinal Infection
(ICD A04, A09; 008, 009)

plotted against glyphosate applied to corn & soy ($R = 0.9738, p \leq 7.632e-09$
Sources USDA:NASS; CDC

*Plot prepared by Nancy Swanson from available data online*
Kidney Failure in Agricultural Workers*

- Workers in sugarcane fields in Central America and in India are dying at a young age in record numbers from kidney failure
- Arsenic exposure from drinking water?
- Excess use of tylenol?

*Glyphosate disrupts the enzyme that breaks down tylenol, leading to tylenol toxicity

*ticotimes.net, San Jose, Costa Rica, August 8, 2013.
Acute Kidney Disease Death Rate Plotted Against Glyphosate and GMOs*

*Plot prepared by Nancy Swanson from available data online
Sri Lanka is the first Country to Ban Glyphosate

Hypothesis

Glyphosate, Hard Water and Nephrotoxic Metals: Are They the Culprits Behind the Epidemic of Chronic Kidney Disease of Unknown Etiology in Sri Lanka?

arsenic
Another Country Responds to Kidney Failure in Agricultural Workers!

El Salvador Bans Monsanto RoundUp
Recapitulation

• We depend on our gut bacteria in many ways
  – Bacteria from an obese person induce obesity in mice
• Glyphosate is an antibiotic that preferentially kills the good bacteria
  – Pigs fed GMO corn and soy develop inflammatory gut
  – Humans are experiencing an epidemic in gut disorders like inflammatory bowel disease and gluten intolerance
  – Due to herbicide-resistant rye grass, farmers use glyphosate as a desiccant at harvest time
• Kidney failure among agricultural workers can be explained by glyphosate
Hexane (正己烷), Glyphosate and Aluminum in Vaccines
Soybean Oil and Protein Products*

Heavily used in processed foods

- “White flakes" made by defatting soybeans by *hexane* extraction

- Protein isolate and soy lecithin

- Fat separated into soybean oil and used in soy infant formula

* EW Lusas and MN Riaz, J Nutr 1995, 125(3 Suppl): 573S-580S.
Protein Bars!

“Most soy protein ingredients in meat analogs and nutrition bars, which are listed on labels as soy protein isolate, soy protein concentrate or textured vegetable protein, have undergone hexane processing.”*

*berkeleywellness.com/healthy-eating/food-safety/article/hexane-soy-food
Toxic Effects of Inhaled Hexane*

- Low: Dizziness, headache, nausea, vomiting
- High: Death from asphyxiation
- Chronic: Peripheral neuropathy, pain, weakness, loss of sensation, impaired gait, muscle atrophy, visual disturbances

*N-HEXANE. Toxicology data network Hazardous Substances Data Bank. US National Library of Medicine
Human Fat and Oil Consumption: US*

*Graphs provided by Dr. Nancy Swanson, with permission
Oil Consumption

Autism & Developmental Delay & Anxiety

Children under 6 yrs. old

ASD, PDD & anxiety vs. vegetable oil consumption
Source: USDA; VAERS

- Autism + PDD + anxiety
- Baking or frying + Salad or cooking oil consumption

Tabulations from US Vaccine Adverse Event Reporting System (VAERS)

* Plots provided by Dr. Nancy Swanson with permission
Aluminum & Mercury

Autism & Developmental Delay & Anxiety

Formula: \( \text{Al} + 1.5 \times (\text{Al w/ Hg}) + 2.0 \times \text{Hg} \)

Tabulations from US Vaccine Adverse Event Reporting System (VAERS)

* Plots provided by Dr. Nancy Swanson with permission
Hypothesis: Glyphosate makes the aluminum and mercury in vaccines more toxic than they would otherwise be.

Tabulations from US Vaccine Adverse Event Reporting System (VAERS)

Formula: \( Al + 1.5 \times (Al \ w/ Hg) + 2.0 \times Hg \)

* Plots provided by Dr. Nancy Swanson with permission
Glyphosate, Autism and Vaccine Reactions*

*Collaboration with Nancy Swanson

MIT Computer Science and Artificial Intelligence Laboratory
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
- Aluminum promotes calcium loss from bones → pineal gland calcification
Aluminum Glyphosate*

Six different ways two glyphosate molecules can chelate aluminum

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

• GM Roundup-Ready soy is a core food crop
  – It is processed into soy formula and protein bars that are contaminated with glyphosate and hexane
• The current vaccine schedule in the US includes many aluminum-containing vaccines
• Aluminum, hexane and glyphosate are synergistically toxic
• Studies of the VAERS database reveal interesting links among aluminum in vaccines, oil consumption and autism, developmental delay and anxiety
Summary

• We should be very worried about glyphosate contamination in the food supply
• Glyphosate usage on corn and soy crops correlates with the epidemic we’re seeing in autism, Alzheimer’s disease, celiac disease, and other intestinal disorders
• This correlation can be explained by the known effects of glyphosate in biological systems
• Glyphosate works synergistically with other important toxic chemicals in our environment, especially arsenic, aluminum and hexane
• Glyphosate should be banned like DDT
Go Organic!
Thank You!
謝謝！