Roundup-Ready: The Far-reaching Impact of Intensive Glyphosate Use
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MIT CSAIL
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http://people.csail.mit.edu/seneff/2019/Seneff_Embry_Riddle_Florida.pptx
“A truth’s initial commotion is directly proportional to how deeply the lie was believed... When a well-packaged web of lies has been sold gradually to the masses over generations, the truth will seem utterly preposterous and its speaker, a raving lunatic.”

- Dresden James
Outline

• Introduction
• The California lawsuit: Glyphosate and non-Hodgkin’s Lymphoma
• Glyphosate and the Gut
• Glyphosate Activism
• A Failed System and a Growing Food Movement
• How to Safeguard Yourself and Your Family
• Summary

Introduction
Roundup and GMO Crops

GMO Roundup-Ready corn, soy, canola, sugar beets, cotton, tobacco and alfalfa

What is glyphosate?

Roundup as a Desiccant/Ripener just before Harvest

Wheat, Oats, Barley, Rye, Sugar cane, Beans, Lentils, Peas, Flax, Sunflowers, Pulses, Chick Peas
Glyphosate!

- Glyphosate is now the #1 herbicide in use in the U.S. and is increasingly used around the world
  - Patented by Monsanto in the mid 1970’s
  - Introduced into the US food chain in 1974
  - Came out from under patent in 2000
- Inhibits an enzyme in the shikimate pathway involved in the synthesis of tyrosine, tryptophan, and phenylalanine (the three aromatic amino acids)
- Huge expansion of GMO corn, soy, cotton and canola crops has led to sharp increases in the last two decades

**Shikimate Pathway Disruption**

- Glyphosate interferes with the shikimate pathway, disrupting the synthesis of phenylalanine, tryptophan, and tyrosine, which are essential for the production of neurotransmitters, thyroid hormone, vitamin K, and folate.

![Image of shikimate pathway diagram](image.png)
Glyphosate vs. Other Pesticides: Usage in the United States*


Environmental Working Group Results*

- www.ewg.org/childrenshealth/glyphosateincereal/
Some Foods Containing Glyphosate

Paper Showing Strong Correlations between Glyphosate Usage and Chronic Disease

*Original Paper*


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

Nancy L. Swanson¹, Andre Leu²*, 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.al@gmail.com
In 2015, WHO IARC declared glyphosate a “probable carcinogen”
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,

Decreasing IQ scores after 1975*

“scores increased by almost 3 percentage points each decade for those born between 1962 and **1975** -- but then saw a steady decline among those born after 1975.”

“What specific environmental factors cause changes in intelligence remains relatively unexplored.”

Decreasing IQ scores after 1975*

“scores increased by almost 3 percentage points each decade for those born between 1962 and 1975, but then saw a steady decline among those born after 1975.”

“What specific environmental factors cause changes in intelligence remains relatively unexplored.”

* Rory Smith, CNN.


Glyphosate was introduced on the market in 1975

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Glyphosate in Human Urine: U.S. Southern California*


Glyphosate reduces sperm motility and sperm count*

*FO Owagbioriaye et al. Experimental and Toxicologic Pathology 2017 Sep 5;69(7):461-468.
Glyphosate Damages Second Generation*

- Pregnant rats exposed to glyphosate starting at day 9 of gestation
- Two exposure levels (low, high), both levels considered to be safe according to regulators
- Neither the rats nor their offspring showed any obvious effects
- The second generation offspring from both exposed groups showed delayed growth, lower fetal weight and length and a higher incidence of abnormally small fetuses
- Most surprising: there were three cases (each from a different mother) among the second generation offspring with major fetal abnormalities (conjoined fetuses and abnormal limb development)

*MM Milesi et al. Archives of Toxicology June 9, 2018 [Epub ahead of print]

America’s Children are in Trouble!

- It is now "normal" for a kindergarten child to have 12 colds every year and for a baby to have nine
- Fourfold increase in childhood obesity
- Double the asthma rate since the 1980's
- "Chronic illnesses" rose from 1.8% in 1960 to 7% in 2004
  - Today, 43% of US children are chronically ill
- 1 in 6 children in the USA has a neurodevelopmental disability
  - 1 in 38 boys are autistic
- US has the worst neonatal death rate of all industrialized countries
- Today's children in the US will have a shortened life span compared to their parents

Source: http://www.vaccineviolence.com/
What’s Making Our Children SICK?

How Industrial Food Is Causing an Epidemic of Chronic Illness, and What Parents (and Doctors) Can Do About It

EXPLORING THE LINKS BETWEEN GM FOODS, GLYPHOSATE, AND GUT HEALTH

Michelle Perro, MD and Vincanne Adams, PhD

SECRET INGREDIENTS
A FILM BY JEFFREY SMITH & AMS HART

GENETICALLY MODIFIED CHILDREN

AVAILABLE ON ITUNES, AMAZON, DVD & BLU-RAY NOVEMBER 14-1

SECRETINGREDIENTSmovie.com
The California Lawsuits: Glyphosate and non-Hodgkin’s Lymphoma

DeWayne Lee Johnson Lawsuit

- Johnson was a groundskeeper for the school district in Benicia, CA, just north of San Francisco
- He was diagnosed with non-Hodgkin’s lymphoma (NHL) in 2014, at age 42.
- In 2015, WHO's IARC classified glyphosate as "probably carcinogenic to humans"
- Donna Farmer, Monsanto’s "product protection lead" said in email to colleagues:
  - "You cannot say that Roundup does not cause cancer."
- Timothy Litzenburg, one of Johnson's lawyers, said:
  - "so much of what Monsanto has worked to keep secret is coming out."
“We’re going to see for the first time evidence that nobody has seen before, evidence that has been in Monsanto’s files that we’ve obtained from lawyers and the people in Monsanto... I don’t think it’s a surprise after 20 years Monsanto has known about the cancer-causing properties of this chemical and has tried to stop the public from knowing it, and tried to manipulate the regulatory process.”

-- Robert F Kennedy, Jr.
Co-counsel for Johnson

“... If we get a large award in this case, it could easily threaten the future financial viability of the company.”

-- Robert F Kennedy, Jr.
Co-counsel for Johnson
Monsanto Loses Landmark Roundup Cancer Trial, Set to Pay USD 289 Million in Damages

Monsanto has lost a landmark cancer trial in San Francisco and has been ordered by the Judge to pay over USD 289 Million in total damages to the former school groundskeeper Dewayne Johnson, a California father who has non-Hodgkin's lymphoma, which was caused by Monsanto's glyphosate-based weedkiller Roundup.

Bayer Stock Prices

Johnson Verdict
Four Ongoing Lawsuits

<table>
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<th>Location</th>
<th>Jury Award</th>
<th>Judge’s Ruling</th>
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<td>Sharlean Gordon</td>
<td>Missouri</td>
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>18,000 more in the works!

Number of Lawsuits over Time*

“In vitro evaluation of genomic damage induced by glyphosate on human lymphocytes”*

- In vitro exposure of human lymphocytes to glyphosate at levels of 0.5, 0.1, 0.050, 0.025 and 0.0125 μg/ml
- 0.5 is considered an "acceptable daily exposure level”
- Chromosomal aberrations and micronuclei frequencies were significantly high at all except the lowest exposure levels.


Lymphocytes are the cell type that transforms into cancer cells in non-Hodgkin’s lymphoma

Glyphosate and the Gut

Imbalanced Gut Microbiome

Inflammatory bowel disease, autoimmune arthritis, obesity and metabolic syndrome, and nonalcoholic fatty liver disease can all be traced to imbalances in gut microbiome*

*Figure 1. RS Goldszmid and G Trinchieri. Nat Immunol 2012;13(10):932-8.
Glyphosate and the Gut: Pathogen Overgrowth

- Glyphosate is an antimicrobial agent that preferentially kills beneficial microbes, allowing pathogens to flourish in the gut*
- Immune cells invade the gut and release inflammatory cytokines
  - This causes increased risk to inflammatory bowel diseases such as Crohn’s, ulcerative colitis as well as Celiac disease (gluten intolerance)


*Figure 20, NL Swanson et al. Journal of Organic Systems 9(2), 2014, p. 25.
Impaired Digestive Enzymes

- Glyphosate has been found as a contaminant in digestive enzymes trypsin, pepsin and lipase*
- Trypsin impairment prevents proteins like gluten in wheat from being digested
- Undigested proteins induce release of zonulin which opens up gut barrier**
- Undigested proteins in the general circulation induce autoimmune disease

Celiac Disease, Glyphosate and Non-Hodgkin’s Lymphoma

- Glyphosate preferentially kills *Bifidobacteria*
- Bifidobacteria are depleted in Celiac disease
- 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.

Pathogen Overgrowth in Poultry Microbes Exposed to Glyphosate*

* Plot provided by Dr. Martin Michener
Evidence linking autism to Clostridia overgrowth*

- 14 autistic children with gut disorder compared to 21 controls
- Significant increase in *Clostridia* species in the gut in autistic children
- Associated with reduced tryptophan levels and increased expression of inflammatory markers
  - Tryptophan is a product of the shikimate pathway, which glyphosate blocks
  - Macrophages in inflamed tissue take up tryptophan, reducing bioavailability to the brain
- Proposed role for antibiotics
  - Glyphosate is a patented antimicrobial agent (2010)

*RA Luna et al., Cellular and Molecular Gastroenterology and Hepatology 2017;3(2): 218-230

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Elevated Urinary Glyphosate and Clostridia Metabolites With Altered Dopamine Metabolism in Triplets With Autistic Spectrum Disorder or Suspected Seizure Disorder: A Case Study

*William Shaw, PhD*

- Triplets: two boys, one girl. Both boys have autism and girl has seizure disorder
- Very high levels of glyphosate in urine in all three
- *Clostridia* overgrowth due to glyphosate disruption of gut microbes
  - Clostridia produce toxins which block the conversion of dopamine to norepinephrine.
  - Damage to neurons in the brain through oxidative stress

*W. Shaw. Integrative Medicine 2017;16(1);50-57.
“In this work, we state a possible link between Gly-induced dysbiosis and cognitive and motor aggravations in neurodegenerative and neurodevelopmental pathologies, such as autism spectrum disorder (ASD). Hence, we review the negative impact that Gly-induced dysbiosis may have on depression/anxiety, autism, Alzheimer’s and Parkinson’s diseases.”

Recapitulation

• Glyphosate contamination in digestive enzymes makes them defective
  – Undigested proteins induce leaky gut barrier and inflammatory bowel disease
• Celiac disease is associated with increased risk to non-Hodgkin’s lymphoma, which is also linked to glyphosate exposure.
• Glyphosate induces overgrowth of Clostridia species in gut
  – Clostridia release toxins that induce an inflammatory response and prevent dopamine metabolism
  – Clostridia overgrowth can lead to autism
• Inflammation in the brain and excessive neurostimulation by dopamine damages neurons
• Gut-brain axis leads to neurological disease following gut dysbiosis
Glyphosate Activism

**MOMS ACROSS AMERICA**

America is in a Health Crisis

- 1 out of 2 children have a chronic illness
- 1 out of 2 males and 1 out of 3 females are expected to get cancer
- 1 out of 5 have a mental illness
- 1 out of 6 has a learning disorder

**WE CAN DO BETTER!**

**HOW?**

Reduce exposure to toxins!
Take steps in 5 areas restore health to your family.

Be UNSTOPPABLE for health, freedom, and the future of our country!

Zen Honeycutt
Tony Mitra: Canadian Activist

Imported lentils laced with weed killer

S.N.V. SUDHAKAR DC
VIJAYAWADA, JULY 18

Indians are consuming highly toxic lentils (masoor dal) and mung dal that are imported from Canada and Australia. A random sample of these lentils was collected in December 2017, it was found to be contaminated with the herbicide glyphosate, that is being used with the toxic chemicals to clear weeds.

Tests conducted by the Canadian Food Inspection Agency revealed the presence of glyphosate in the lentils. The government of Canada found its annual consumption in 2016 at 3.8 million parts per billion, and 1,600 parts per billion of glyphosate, respectively, well above the 100 parts per billion standard.

Some lentils, that were imported from India by some Canadian restaurants, were being sold in the US market. The samples were collected in December 2017, and it was found to be contaminated with glyphosate.

Indians have been consuming a large amount of lentils. The government of India has been the largest producer and consumer of lentils. India has also become a huge importer of pulses.

On an average, India has been importing 5.5 million tons of pulses in the last 4 years. Almost half of this quantity is imported from Canada and Australia. It also includes environmentally friendly pulses from Myanmar, Ecuador, Russia and Argentina among others.

Glyphosate is known to be highly toxic and harmful to health. It can adversely affect immunity to serious diseases and the absorption of mineral and vitamin nutrients. It can cause reproductive problems related to the sperm.

Tony Mitra speaking to crowds of Indian Farmers and Villagers

Villagers in Bankura, West Bengal, India

North Dinajpur in Northern Bengal, India.

Tony Mitra: Canadian Activist

Imported lentils laced with weed killer

DC CORRESPONDENT VIJAYAWADA, JULY 18

Food safety and agricultural scientists are warning that the use of glyphosate may pose a threat. They are worried that these lentils and mung dal may have caused kidney problems in other countries. It has been found that the lentils and mung dal grown in Canada and Australia are highly toxic. It is very difficult to find out if we are consuming Canadian pulses and lentils in India. They are sold as local pulses and lentils from outside for glyphosate.

He said that 47 percent of Canadian lentils were contaminated and the average level of contamination was 250 parts per billion. Some of the lentils and mung dal grown in Canada and Australia were being sold in India under the name of local pulses.

Tony Mitra speaking to crowds of Indian Farmers and Villagers

Villagers in Bankura, West Bengal, India

North Dinajpur in Northern Bengal, India.

Tony Mitra speaking to crowds of Indian Farmers and Villagers

Villagers in Bankura, West Bengal, India

North Dinajpur in Northern Bengal, India.
Local Activism*

A small group of activists succeeded in getting a law passed banning aerial spraying of glyphosate in the forests of western Oregon despite tremendous industry-funded campaigns

A Failed System and A Growing Food Movement

“Is Agriculture’s Use of Glyphosate Feeding Lake O’s Explosive Algae Blooms?”*

- Sugar cane agriculture is extensive all around Lake Okeechobee in S. Florida, and glyphosate is used both to control weeds and as a desiccant.
- Cyanobacteria can break down the C-P bond in glyphosate and use its phosphorus atom as a fuel source**

Cyanobacteria Feed Red Tide Algae

“Both the coastal red tide and the inland blue-green algae have beset South Florida through the summer, killing vast numbers of fish and other wildlife, including dozens of dolphins, manatees, sea turtles, sharks and eels.” *

- Cyanobacteria feed off of glyphosate (phosphorus source) and produce nitrates from nitrogen
- Red Tide algae flourish, supplied with nitrates produced by cyanobacteria **

**https://www.sailorsforthesea.org/programs/ocean-watch/nutrients-feed-red-tide

Test of Glyphosate Levels in Florida Waterways*

Water sample taken from the coast of Cape Coral, at the mouth of the Caloosahatchee River, where cyanobacteria were present

*https://www.momsacrossamerica.com/orange_juice_postive_for_glyphosate_again
Concerns about Glyphosate and Citrus*

Chief among these concerns are:

- Increased crop sensitivity to diseases
- Reduced availability of micronutrients to crops through chelation by glyphosate
- Inhibition of root growth
- Citrus fruit drop

“As citrus weed management programs have continued to rely more heavily on glyphosate, the occurrence of citrus fruit drop resulting from glyphosate application has become an increasing grower concern over the years.”

*http://citrusindustry.net/2018/09/05/how-to-handle-glyphosate-related-fruit-drop/

Moms Across America founder Zen Honeycutt has found glyphosate in multiple samples of orange juice produced from Florida orange groves

*http://citrusindustry.net/2018/09/05/how-to-handle-glyphosate-related-fruit-drop/
Warning of 'ecological Armageddon' after dramatic plunge in insect numbers

Three-quarters of flying insects in nature reserves across Germany have vanished in 25 years, with serious implications for all life on Earth, scientists say


Prof. Don Huber on Bee Colony Collapse Syndrome*

• Glyphosate chelates minerals making them unavailable, especially manganese
• Glyphosate kills Lactobacillus and Bifidobacter which interferes with digestion of honey and bee bread by larvae
  – Makes bees more susceptible to mites and viruses
• Acting as an endocrine disruptor, glyphosate causes brain fog in the bees, and they can't find their way back to the hive after foraging
  – Neonicotinoids have a similar, synergistic effect
• Glyphosate is a contaminant even in organic honey because it is pervasive
• Probiotics + mineral solutions counter glyphosate's effects remarkably

*personal communication
Successful Treatment Protocol for Bees*

- Average loss rates in bee hives in the U.S. for the winter of 2015-2016 was 38%
- Slide Ridge Honey had only a 5% loss rate
  - Their success was attributed to mineral supplements and probiotics

*biomineraltechnologies.com/save-the-bees/honeybee-update-2017

Glyphosate was found in 59% of Honey Samples*

*F Rubio et al., J Environ Anal Toxicol 2014, 5:1

Sample numbers, grouped by country of origin and use of GMO foods
Superweeds Are Now a Huge Problem*

- 76.8% of samples submitted to a U of Illinois Plant Clinic from 10 states across the Midwest showed glyphosate resistance
- “GM crops are on the edge of failure in the U.S. as farmers are asked to fork out more and more money on herbicides to try to control the superweeds. We simply can’t afford it! It is near the end of the road for these crops and many of my friends in the Midwest are on the edge of turning back to conventional farming methods.”
  – Bill Giles, an Illinois farmer


Antibiotic Resistance and Glyphosate*

* unsustainablepulse.com/2017/02/04/farmers-losing-midwest-superweeds-fight-as-glyphosate-resistance-reaches-over-75/#
Antibiotic Resistance and Glyphosate*

Glyphosate was patented as an antimicrobial agent in 2004.**

Microbes develop efflux pumps in response to chronic glyphosate exposure that can then pump out other antibiotics as well.

$\text{1940} \quad 1960 \quad 1980 \quad 2000 \quad 2020$

$\text{Antibiotics resistance papers} \quad \text{Glyphosate use}$

**U.S. patent number 20040077608 A1, filed: August 29, 2003; awarded: April 22, 2004

Fixing the Soil*

- Dirt is inert; soil is alive
- Missouri farmer JR Bollinger grew corn and soy on a former coal mine
- “We tried ... all kinds of goodies: humates, ... sea minerals, microbes, fish meal and biochar powder.”
  - Earthworms till the soil
  - Soil microbes are crucial for soil health
- Greatly reduce fertilizer needs and improve yield

*David Yarrow. Down the Wormhole: Customizing Biological Methods for Large Scale Farming Belize Ag Report 2017;34:5-17.
Solving Global Climate Change through Agriculture*

“Agriculture, with its unique ability to sequester carbon on ... billions and billions of acres, is the only industry poised to reverse global warming. Improved management of cropping and grazing heals land, boosts soil fertility, prevents flooding, enhances drought resilience, increases the nutritional content of food and restores wildlife habitat — while sequestering carbon.


Regenerative Agriculture*

- The Goal: Improving soil health
- The more plants that grow, the better the soil
- Use adaptive high stock density (AHSD) grazing, the way the bison did it

Regenerative Agriculture*

"Regenerative agriculture is a phenomenal system that has always been here, activated by the sunshine and the rain. It not only restores our land in terms of biodiversity and soil health, but also produces incredibly nutrient dense, vibrantly flavored food."

- The Goal: Improving soil health
- The more plants that grow, the better the soil
- Use adaptive high stock density (AHSD) grazing, the way the bison did it

*Dirt to Soil*

- Gabe Brown inherited a 5,000 acre farm from his father-in-law that grew wheat, oats and barley, conventionally
  - His crop failed due to drought for four straight years
  - He let it lie fallow and let the weeds grow
  - The soil improved dramatically: earthworms started to appear
  - He used less glyphosate to control weeds only because he couldn't afford it
- He eventually converted it to a certified organic farm, with animals playing a central role
  - Profitable organic farm produces beef, lamb, eggs, broilers, pigs, honey, vegetables, fruit, corn, and wheat.

Gabe Brown inherited a 5,000 acre farm from his father-in-law that grew wheat, oats, corn, oats and barley, conventionally—His crop failed due to drought for four straight years—He let it lie fallow and let the weeds grow—The soil improved dramatically: earthworms started to appear—He used less glyphosate to control weeds only because he couldn’t afford it

He eventually converted it to a certified organic farm, with animals playing a central role—Profitable organic farm produces beef, lamb, eggs, broilers, pigs, honey, vegetables, fruit.


Small Organic Farms are the Answer

Bluebird Hill Organic Farm, North Carolina
How to Safeguard Yourself and Your Family

Go Organic!
Eat Natural Probiotic Foods

• Sauerkraut and apple cider vinegar contain Acetobacter, one of the very few microbes that can metabolize glyphosate
• Kombucha and kimchi do too!

Some Important Nutrients

• Curcumin
• Garlic
• Vitamin C
• Methyl tetrahydrofolate
• Cobalamin
• Glutathione
• Taurine
• Epsom salt baths
Biochar, Bentonite and Zeolite to maintain healthy microbial distribution in poultry*


Extracts from Common Plants Can Treat Glyphosate Poisoning*

- Roundup is toxic to hepatic and embryonic cells at doses far below those used in agriculture and at residue levels present in some GM food.
- Extracts from common plants such as dandelions, barberry, and burdock can protect from damage, especially if administered prior to exposure.

*C Gasnier et al. Journal of Occupational Medicine and Toxicology 2011, 6:3
Making Bone Broth a Staple in Your Diet May Be the Key to Improving Your Health*


Conclusions

• We are at a crossroads where we can choose to get sicker and sicker while destroying the ecosystem, or we can choose to drastically change our agricultural methods towards renewable organic solutions

• Grass roots bottom-up activities will institute a dramatic shift in food choices towards nutrient-dense organic whole foods instead of chemical-contaminated impoverished processed foods

• A market-driven economy will force farmers to switch to organic methods if they want to sell their crops to informed and health-conscious consumers

• This will lead to a dramatic reduction in health care costs and a vast improvement in the health of the population as a whole, of the nation, and of the earth
Thank You for Listening!