



"If our extinction proceeds slowly enough to allow a moment of horrified realization, the doers of the deed will likely be quite taken aback on realizing that they have actually destroyed the world."

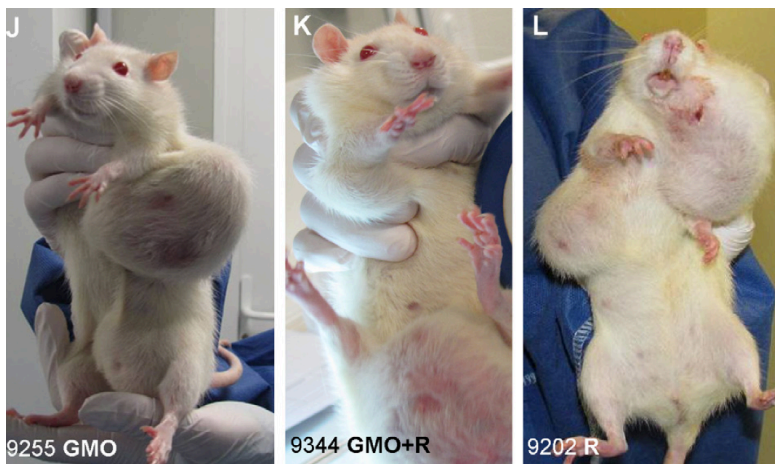
- Eliezer Yudkowsky

Outline: Part II

- Experiments on Breast Cancer Cells
- Glyphosate, Sulfate, Oxalate, Autism
- Roundup, StAR and Sterol Homeostasis
- A Failed System and A Growing Food Movement
- How to Safeguard Yourself and Your Family
- Conclusions

Experiments with Breast Cancer Cells

Mammary Tumors in Rats*



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

*GE Seralini et al., Environ Sci Eur 26 (2014): 14.

Antoniou et al. *BMC Res Notes* (2019) 12:494
<https://doi.org/10.1186/s13104-019-4534-3>

BMC Research Notes

RESEARCH NOTE

Open Access

Glyphosate does not substitute for glycine in proteins of actively dividing mammalian cells



Michael N. Antoniou^{1*}, Armel Nicolas^{2,3}, Robin Mesnage¹, Martina Biserni¹, Francesco V. Rao^{2,4} and Cristina Vazquez Martin²

Abstract

Objectives: Glyphosate (*N*-phosphonomethyl glycine) and its commercial herbicide formulations have been shown to exert toxicity via various mechanisms. It has been asserted that glyphosate substitutes for glycine in polypeptide chains leading to protein misfolding and toxicity. However, as no direct evidence exists for glycine to glyphosate substitution in proteins, including in mammalian organisms, we tested this claim by conducting a proteomics analysis of MDA-MB-231 human breast cancer cells grown in the presence of 100 mg/L glyphosate for 6 days. Protein extracts from three treated and three untreated cell cultures were analysed as one TMT-6plex labelled sample, to highlight a specific pattern (+/+ +/+/—/—) of reporter intensities for peptides bearing true glyphosate treatment induced-post translational modifications as well as allowing an investigation of the total proteome.

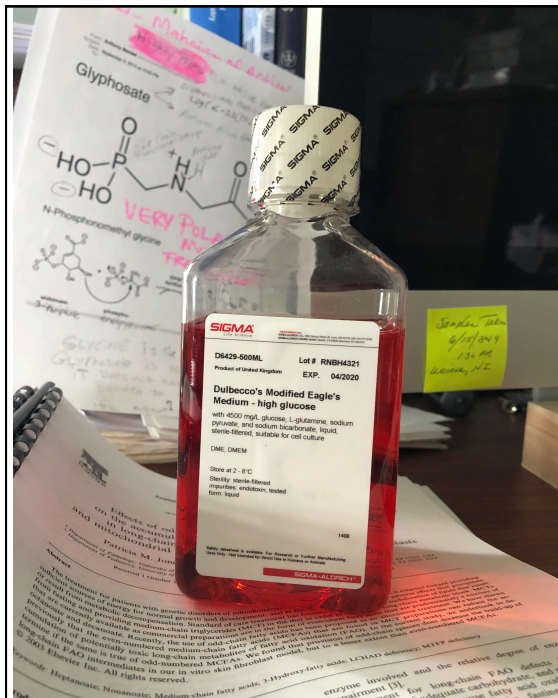
Results: Comparative statistical analysis of global proteome changes between glyphosate treated and non-treated samples did not show significant differences. Crucially, filtering of data to focus analysis on peptides potentially bearing glycine for glyphosate replacement revealed that the TMT reporter intensity pattern of all candidates showed conclusively that they are all false discoveries, with none displaying the expected TMT pattern for such a substitution. Thus, the assertion that glyphosate substitutes for glycine in protein polypeptide chains is incorrect.

Keywords: Glyphosate, Glycine, Proteome

“Glyphosate does not substitute for glycine in proteins of actively dividing mammalian cells”*

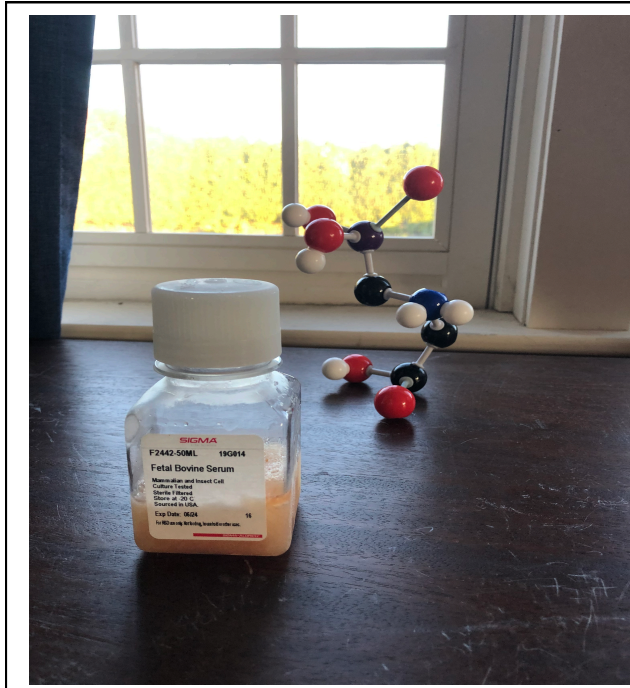
- Breast cancer cells grown in vitro in six cultures
- Half were exposed to glyphosate for six days
- Used Tandem Mass Tag technology w/ spectrometry to find anomalously heavy peptides
- At least 15 short peptides with specific glyphosate substitutions were identified
- Claimed all results were spurious because they showed up in equal amounts in “untreated” cells

*Antoniou *et al. BMC Res Notes (2019) 12:494*



Dulbecco's Modified Eagle's Medium: High Glucose

- All cells were grown in culture with Dulbecco's
- Glyphosate contaminated?
 - Anthony Samsel found 10.5 ppb glyphosate in glucose
- Both “treated” and “control” cells were probably inadvertently treated with glyphosate for their entire life in vitro and in vivo



Fetal Bovine Serum

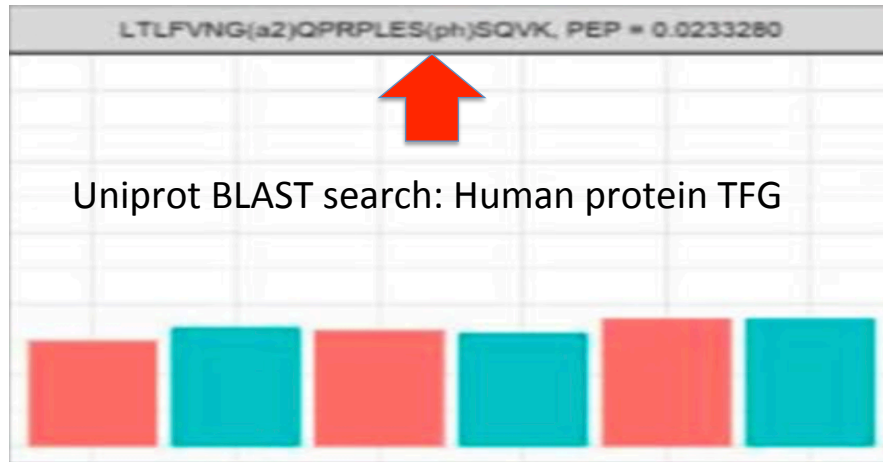
Tumor cells have been maintained on fetal bovine serum since they were harvested from a human breast and for the duration of the experiment

“Glyphosate does not substitute for glycine in proteins of actively dividing mammalian cells”*



* Figure 3. Antoniou *et al.* *BMC Res Notes* (2019) 12:494

LTLFVNG(a2)QPRPLES(ph)SQVK



BLAST: <https://www.uniprot.org/blast/>

Exploring One Match

- Protein TFG (TRK-fused gene)
 - Expressed as a fusion partner in many different cancers: thyroid cancer, large cell lymphoma, myxoid chondrosarcoma ...
- The analogue gene in roundworms suppresses apoptosis (promotes tumor growth)
- Expressed at high levels in brain and spinal cord
 - Mutations linked to severe neurological and motor disease resembling ALS, with muscle weakness, atrophy, twitches and painful cramps, as well as numbness, tingling, burning, pain
- Other matches are markers for poor prognosis in cancer and/or promote proliferation and invasiveness

Glyphosate-Susceptible Motif

- EPSP synthase is the enzyme suppressed by glyphosate in the shikimate pathway
- Glyphosate interferes with phosphate binding by occupying the spot where phosphate in PEP should fit
- If the highly conserved glycine residue at this site is mutated to alanine, the protein is immune to glyphosate
- Nearby positively charged amino acids secure PEP (and glyphosate) in place through magnetic charge attractions

Hypothesis Well Supported

- **Hypothesis:** a glycine residue with a small amino acid to the left and a positively charged amino acid to the right is highly susceptible to glyphosate substitution
- Nine of the 15 matches in the Antoniou et al. paper had a small amino acid immediately to the left
- Six of the 15 matches in the Antoniou et al. paper had a positively charged amino acid immediately to the right
- Probability of this occurring by chance is very small

9 Matches were Phosphate Binding Proteins*

Sequence	Protein Name (Uniprot Code)	Phosphate-binding
AIRQTSELTLG*K	Zinc finger protein 624 (Q9P2J8)	DNA
DG*QDRPLTKINSVK	Pleckstrin homology domain-containing family A member 5 (Q9HAU0)	PtdIns phosphate
EPVASLEQEEQG*K	Double homeobox protein A (Q9UBX2)	DNA
G*ELVMQYK	Diacylglycerol kinase gamma (P49619)	ATP
GKELSG*LG*SALK	Very long-chain specific acyl-CoA dehydrogenase mitochondrial (P49748)	FAD
KDGLG*GDK	G-protein coupled receptor 158 (Q5T848)	GTP
NEKYLG*FGTPSNLGK	ATP-dependent Clp protease ATP-binding subunit (076031)	ATP
RTVCAKSIFELWG*HG QSPEELYSSLK	tRNA (guanine(10)-N2)-methyltransferase homolog (Q7Z4G4)	tRNA
VTG*QLSVINSK	Protein O-mannosyl-transferase 2 (Q9UKY4)	dolichyl phosphate

All 15 sequences identified by Antoniou *et al.*
had exact matches to human proteins in BLAST

*people.csail.mit.edu/seneff/does_glyphosate_substitute.html

Two Proteins Overexpressed in Cells Exposed to Glyphosate for 6 Days

ANT (ADP/ATP nucleotide translocase):

- Programs cell to implement strategies that lead to increased proliferation instead of apoptosis (cell death) in presence of stressors
- There has been recent interest in developing drugs that fight cancer by suppressing ANT Activity.

SRSF6 (serine/arginine-rich splicing factor 6 (SRSF6):

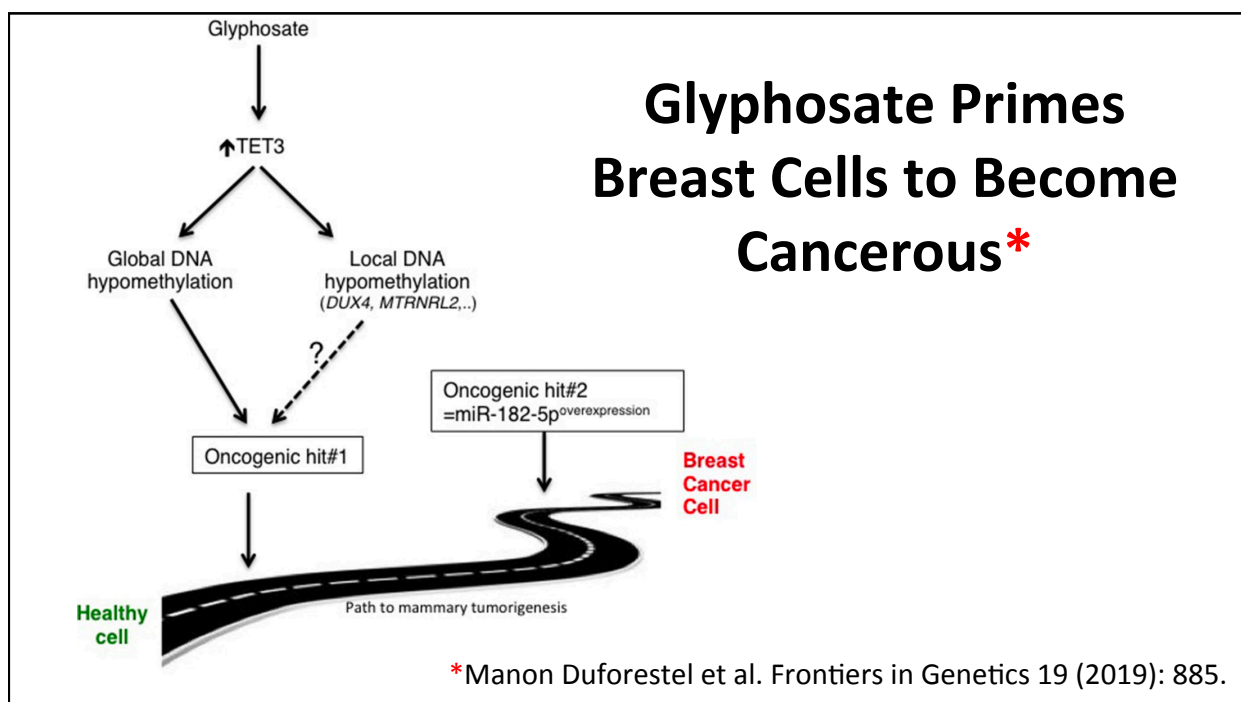
- Overexpression of SRSF6 in lung epithelial cells enhanced proliferation, protected them from chemotherapy, and increased their ability to form tumors.
- Knockdown of SRSF6 in cancer cells reduced their tumorigenic potential.
- SRSF6 in skin cancer alters the splicing of a protein called tenascin C so as to promote invasive and metastatic 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*



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



Glyphosate, Sulfate, Oxalate, Autism

Sulfate in Fetal Development*

- Fetus depends on mother for sulfate supply
- Sulfate is essential for transporting sterols (like estrogen and DHEA) and supplying extracellular matrix proteins everywhere with sufficient negative charge
- Sulfate detoxifies xenobiotics like **acetaminophen (Tylenol)** and is essential for excreting toxins like **aluminum** and **mercury**
- Sulfate is severely deficient in autistic children (1/3 the normal level of free sulfate in blood stream)

* PA Dawson, "Sulfate in Fetal Development,"
Semin Cell Dev Biol 2011;22(6): 653-9.

Thyroid and Sulfate

- Autism is associated with disrupted sulfate management
→ systemic sulfate deficiency*
- Glyphosate suppresses pituitary release of thyroid stimulating hormone (TSH) → hypothyroidism**
- Hypothyroidism in mom is linked to autism in child***
- Hypothyroidism causes sulfate loss in urine****

*RH Waring and LV Klovrza. J Nutr & Environ Med 2000; 10: 25-32.

**JS de Souza et al. Toxicology. 2017 Feb 15;377:25-37.

***GC Román, Ann Neurol 2013;74(5):733-42.

****K Sagawa et asl. Am J Physiol. 1999 Jan;276(1 Pt 2):F164-71.

Rosemary Waring on Autism (1990)*

“These results indicate that there may be a fault either in manufacture of sulphate or that sulphate is being used up dramatically on an unknown toxic substance these children may be producing .”

*p. 198, O’Reilly, B.A.; Waring, R.H. Enzyme and sulphur oxidation deficiencies in autistic children with known food/chemical intolerances. *Xenobiotica*. 1990, 20, 117–122.

Rosemary Waring Found Extremely Abnormal Urinary Sulfur Products in Autism*

TABLE 1. Excretion of urinary protein and anions in autism

	Autism (n = 232)	Controls (n = 68)
Age (years)	7.6 ± 2.4	8.5 ± 3.7
Protein $\mu\text{g ml}^{-1}$	103.2 ± 89.9*	64.5 ± 27.5
Sulphite	106.9 ± 162.9*	2.1 ± 6.3
Thiosulphate	130.8 ± 148.1*	18.6 ± 25.0
Thiocyanate	6.4 ± 16.9*	44.0 ± 101.0
Sulphate	6819.0 ± 6712.3*	3030.8 ± 1461.0

Anion excretion is given in nmol ml^{-1} , mean ± SD* $p < 0.001$ (Wilcoxon rank sum test).

* RH Waring and LV Klovrrza. Journal of Nutritional & Environmental Medicine 2000; 10: 25-32.

Rosemary Waring Found Extremely Abnormal Urinary Sulfur Products in Autism*

> 50-fold increase in urinary sulfite suggests a deficiency in sulfite oxidase

Protein $\mu\text{g ml}^{-1}$	103.2 ± 89.9*	64.5 ± 27.5
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Glyphosate Plausibly Disrupts Sulfur Enzymes

Sulfite oxidase (SuOx)*

- Depends on molybdenum as catalyst (glyphosate chelation could make it unavailable)
- Changing glycine at residue 473 with aspartate destroys enzyme activity
 - Leads to severe impairment in ability to bind sulfite and 5-fold reduction in catalysis
 - Aspartate has similar properties as glyphosate, being bulky and negatively charged
- Defective SuOx leads to severe birth defects and neurological problems resulting in early death

The sulfotransferases**

- GxxGxxK motif required for binding PAPS (activated sulfate)

*H.L. Wilson et al., Biochemistry 2006, 45, 2149-2160 2149.

**K. Komatsu et al., Biochemi and Biophys Res Comm 1994;204(3): 1178-1185.

GxxGxxK Motif in Sulfotransferases*

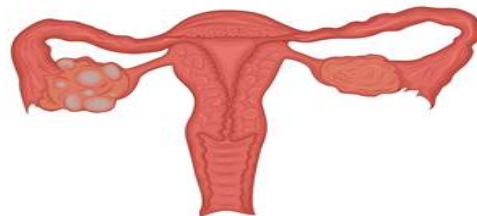
- Sulfotransferases are crucial to attach sulfate ions to multiple bioactive molecules
- **Steroids** (cholesterol, estrogen, testosterone, vitamin D, ...)
- **Glycosaminoglycans** (chondroitin sulfate, heparan sulfate, ...)
- **Polyphenols, aromatics** (curcumin, resveratrol, tryptophan, ...)
- **Neurotransmitters** (dopamine, serotonin, melatonin, ...)

A	Human liver PST-M	G	M	A	G	D	W	K	T	T	F	T	V	A	Q	N	I
	Human liver PST-P	G	M	A	G	D	W	K	T	T	F	T	V	A	Q	N	I
	Human liver AST ₁	G	M	A	G	D	W	K	T	T	F	T	V	A	Q	N	I
	Human brain AST ₂	G	M	A	G	D	W	K	T	T	F	T	V	A	Q	N	I
	Human brain AST ₃	G	M	A	G	D	W	K	T	T	F	T	V	A	Q	N	I
	Human placenta EST	G	M	A	G	D	W	K	T	T	F	T	V	A	Q	N	I
B	Human liver EST	G	I	T	G	D	W	K	N	H	F	T	V	A	L	N	I
	Guinea pig adrenal EST	G	I	S	G	D	W	K	N	H	F	T	V	A	L	N	I
	Bovine placenta EST	G	D	V	G	D	W	K	N	H	F	T	V	A	L	N	I
	Rat liver EST	G	I	V	G	D	W	K	N	H	F	P	E	A	L	R	I
	Rat liver PST	G	T	T	G	D	W	K	N	T	F	T	V	A	Q	N	I
	Mouse liver PST	G	T	I	G	D	W	K	N	T	F	T	V	A	Q	S	I
C	Human liver HST	G	V	S	G	D	W	K	N	H	F	T	V	A	Q	A	I
	Human liver HST	G	V	S	G	D	W	K	N	H	F	T	V	A	Q	A	I
	Human liver HST	G	V	S	G	D	W	K	N	H	F	T	V	A	Q	A	I
	Mouse liver HST	G	T	I	G	D	W	K	N	H	F	T	V	A	Q	A	I
	Rat liver HST	G	T	V	G	D	W	K	N	H	F	T	V	S	Q	A	I
	Rat liver HST	G	T	T	G	D	W	K	N	H	F	T	V	A	Q	A	I
	Guinea pig adrenal HST	G	T	V	G	D	W	K	N	H	F	T	V	A	Q	A	I

*H Chiba et al. Proc. Natl. Acad. Sci. USA 1995; 92:8176-8179.

Polycystic Kidney Disease (PCOS)*

- PCOS is the most common reproductive disorder in the world
 - It affects 8-20% of women of reproductive age
- 40% of women with PCOS develop infertility
- 90-95% of women being treated in infertility clinics who have impaired ovulation suffer from PCOS



*medium.com/@drjasonfung/the-faces-of-polycystic-ovary-syndrome-pcos-4491740c69ae

PCOS, Autism, PAPS Synthase

- PAPS synthase converts sulfate to an activated form
- It is essential for DHEA sulfate synthesis
- Defective PAPS synthase → polycystic ovary syndrome (PCOS) in women, high androgen*
 - Glycine 270 → aspartate mutation
- PCOS is a risk factor for autism in the woman and in her children**



*Cherskov et al. Translational Psychiatry 2018; 8:136.

**W Oostdijk et al. J Clin Endocrinol Metab. 2015;100(4):E672-80.

Autism-like socio-communicative deficits and stereotypies in mice lacking heparan sulfate*

- Experiment with “designer” mice: blocked heparan sulfate synthesis in brain ventricles
 - Mice exhibited all the classic features of autism – both cognitive and social



"Fractone-associated N-sulfated heparan sulfate shows reduced quantity in BTBR T+tf/J mice: a strong model of autism." **

* F. Irie et al., PNAS Mar. 27, 2012, 109(13), 5052-5056.

** KZ Meyza et al., Behav Brain Res 2012;228:247–53.

“Heparan sulfate deficiency in autistic postmortem brain tissue from the subventricular zone of the lateral ventricles”*

“Aberrant extracellular matrix glycosaminoglycan function localized to the subventricular zone of the *lateral ventricles* may be a biomarker for autism, and potentially involved in the etiology of the disorder.”

New neurons develop from stem cells in this zone through the action of “fractones” composed of heparan sulfate proteoglycans**

* BL Pearson et al., Behav Brain Res. 2013;243:138-45

** F. Mercier et al., Neuroscience Letters 506 (2012) 208–213

Is Encephalopathy a Mechanism to Renew Sulfate in Autism?*

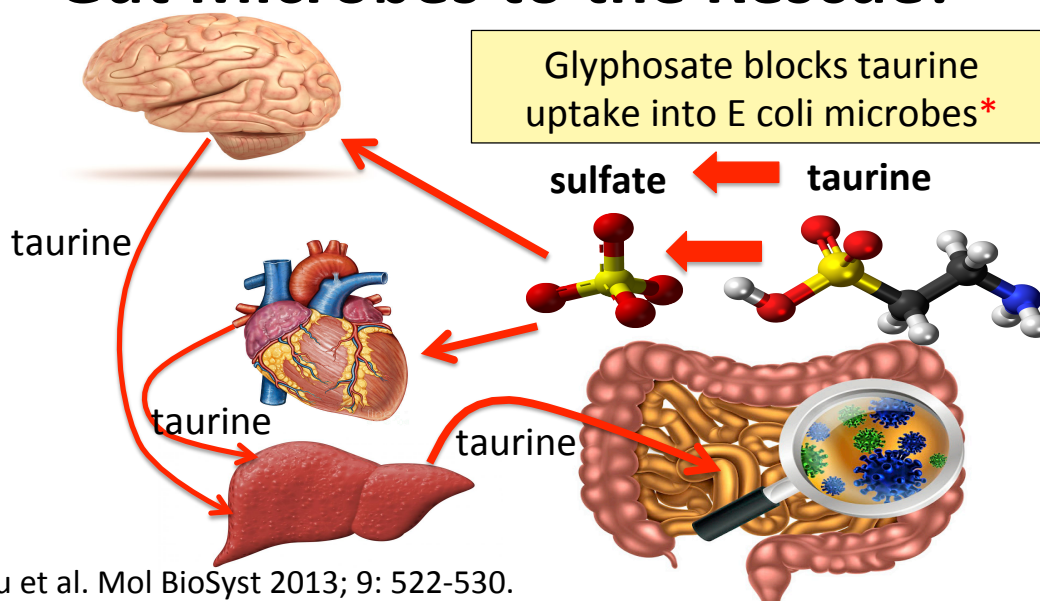
Abstract: “This paper makes two claims:

(1) Autism can be characterized as a chronic low- grade encephalopathy, associated with excess exposure to nitric oxide, ammonia and glutamate in the central nervous system, which leads to hippocampal pathologies and resulting cognitive impairment, and

(2) Encephalitis is provoked by a systemic deficiency in sulfate, but associated seizures and fever support sulfate restoration. ...”

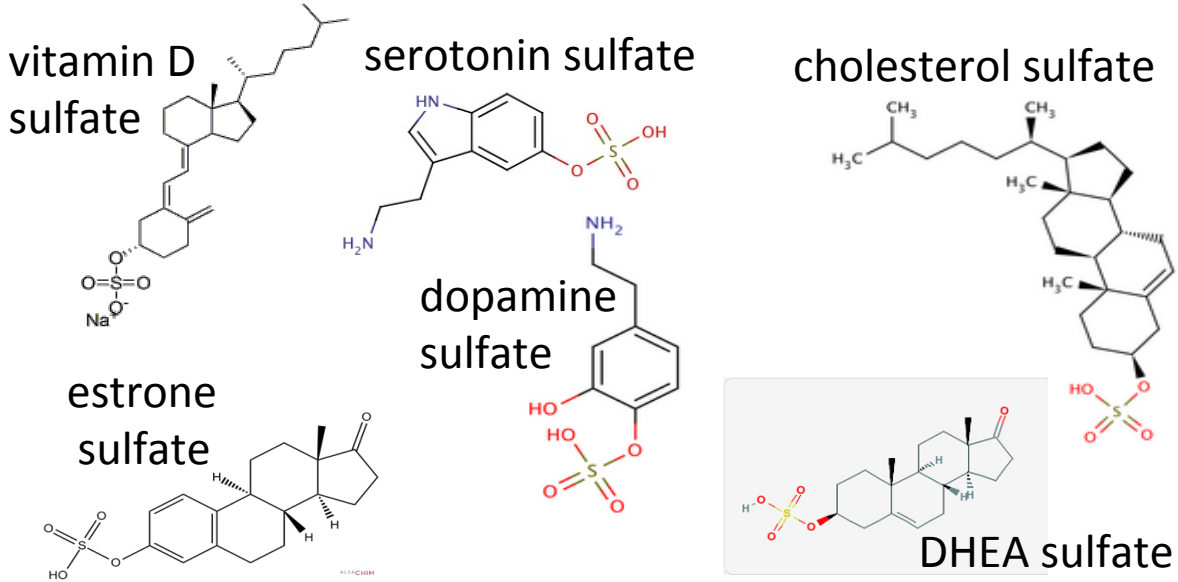
*S Seneff et al., Entropy 2013; 15: 372-406.

Gut Microbes to the Rescue!

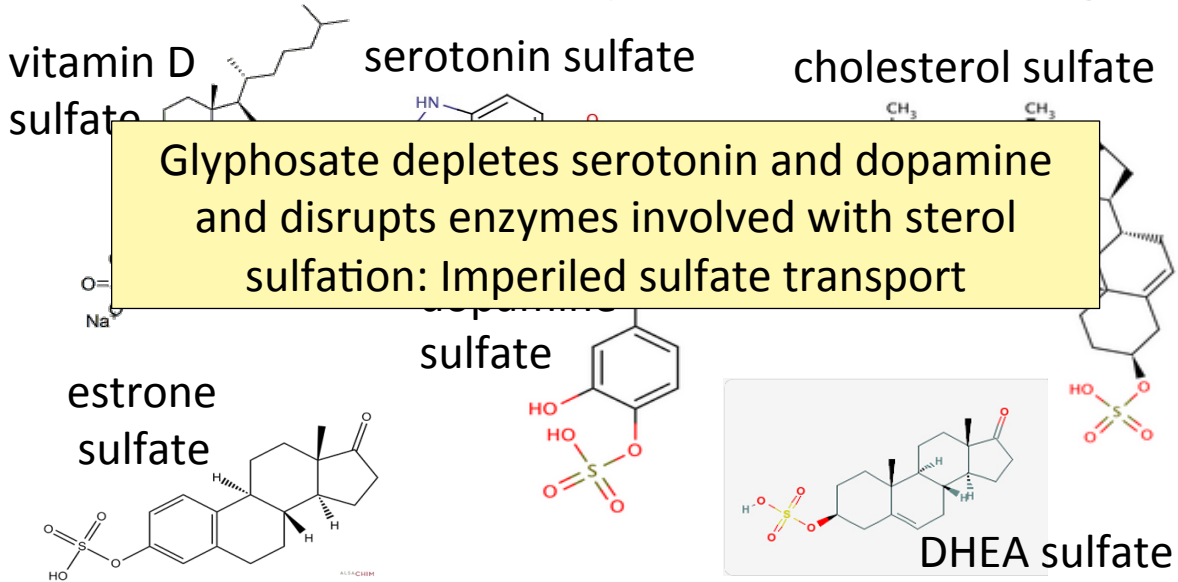


*W Lu et al. Mol BioSyst 2013; 9: 522-530.

Safe Sulfate Transport: Carbon Rings



Safe Sulfate Transport: Carbon Rings



Recapitulation

- Sulfate plays many essential roles in the body
 - Sulfate deficiency is a core feature of autism
- Sulfate synthesis and transfer depend critically on both glycine residues and molybdenum
- PCOS due to glycine mutation is a risk factor for autism
- Heparan sulfate deficiency in the brain is associated with autism in both humans and mouse models
- A low grade encephalopathy characterizes autism and may reflect the need to synthesize sulfate

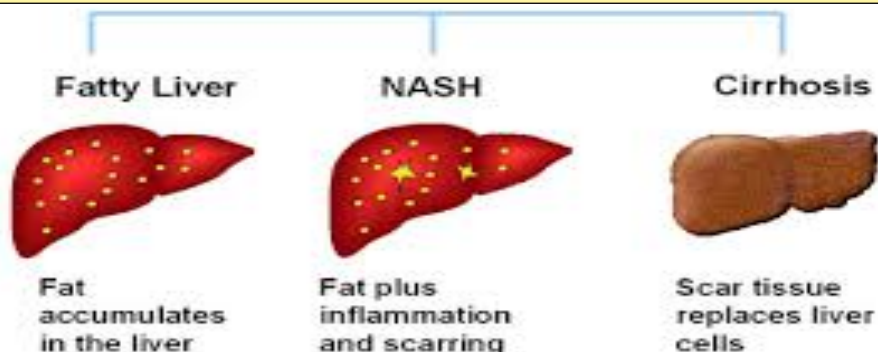
Roundup, StAR and Sterol Homeostasis



StAR:
Steroidogenic
Acute
Regulatory
protein

Non-alcoholic Fatty Liver Disease: An Epidemic in America

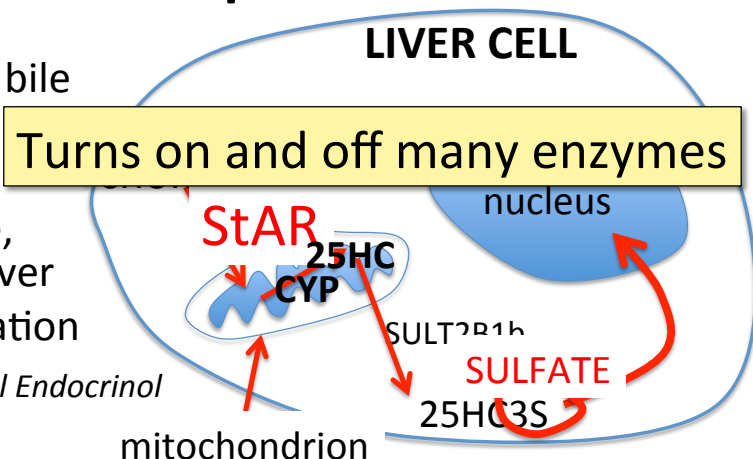
NAFLD affects almost one-quarter of the general U.S. population



“**Sulfation** of 25-hydroxycholesterol regulates lipid metabolism, inflammatory responses, and cell proliferation”*

- Cholesterol and fats shipped out through bile acids
- Fixes fatty liver
- Liver cells proliferate, restoring damaged liver
- Suppresses inflammation

*S Ren and Y Ying, *Am J Physiol Endocrinol Metab* 306: E123–E130, 2014



StAR is a Superstar!

- StAR protects from fatty liver disease and elevated serum LDL by promoting bile flow
- StAR is essential for synthesis of cortisol, testosterone and estrogen by the adrenal glands and by the gonads
- StAR induces export of cholesterol from cardiovascular plaque into HDL

Roundup Inhibits Steroidogenesis by Disrupting StAR Protein Expression*

- In vitro study on testicular Leydig cells
- Roundup reduced testosterone synthesis *by 94%*
 - Effect due to both StAR suppression (90%) and CYP suppression (70%)
- Reduction in StAR expression in the adrenal gland disrupts synthesis of stress hormones and sex hormones
- This likely explains epidemic in eczema!



*LP Walsh et al., Environ Health Perspect 2000; 108:769-776

Atopic Eczema: An Epidemic

- Atopic eczema (AE) affects between 15 and 20% of people in industrialized countries*
 - It has very low prevalence in rural Africa
 - Epidemic developed over past 40 years
- Especially prevalent in young children
- Topical steroids (corticosteroids) are popular treatment option
- Overuse of steroids leads to skin thinning and adrenal insufficiency**



*K Thestrup-Pedersen. J Cosmet Dermatol 2003; 2(3-4): 202-10.

**C Levin and HI Maibach. Am J Clin Dermatol. 2002;3(3):141-7.

Eczema and StAR

- Th2 immune cells are fully capable of synthesizing the steroid pregnenolone from cholesterol, using StAR and CYP enzymes*
- This inhibits immune cell proliferation and production of immunoglobulin G, linked to eczema **
 - Resolves inflammation and eczema flare-ups
- StAR expression is decreased or absent in keratinocytes in psoriatic and atopic dermatitis***



*Bidesh Mahata et al., Cell Reports 2014; 7: 1130-1142.

**AC Ferguson and FA Salinas, J Allergy Clin Immunol 1984; 74(5): 678-82.

***Andrzej Slominski et al., J Steroid Biochem Mol Biol 2013; 137: 107-123.

Recapitulation

- StAR, CYP enzymes and sulfotransferases collaborate to convert cholesterol into sulfated sterols with many important biological roles
- Glyphosate disrupts all of these proteins, leading to many diseases
 - Fatty liver disease
 - Impaired bile flow
 - Adrenal insufficiency
 - Cardiovascular plaque
 - Atopic dermatitis

Resolution of inflammation depends critically on synthesis of sulfated sterols

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**



*Prof. Geoffrey Norris.<https://jacquithurlowlippisch.com/tag/is-sugarcane-field-glyphosate-feeding-lake-os-blue-green-algae-blloms>

**D Drzyzga et al. Environ Microbiol 2017 Mar;19(3):1065-1076

Cyanobacteria Feed Red Tide Algae

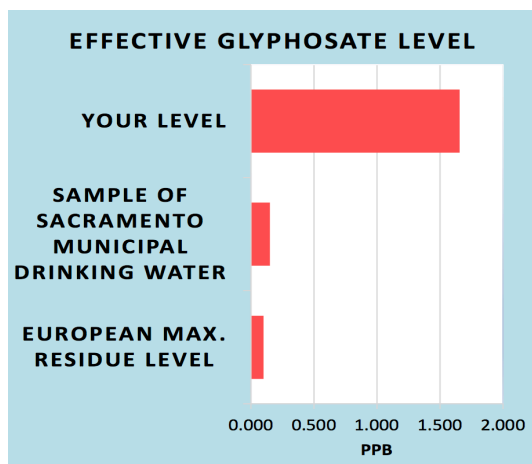
“Both the coastal red tide and the inland blue-green algae have beset South Florida through the summer, killing vast numbers of fish and other wildlife, including dozens of dolphins, manatees, sea turtles, sharks and eels.” *

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

*<https://www.nbcnews.com/news/us-news/toxic-red-tide-florida-researchers-investigate-what-s-making-it-n900771>

**<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/>

Concerns about Glyphosate and Citrus*

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- Reduced availability of micronutrients to



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

“A
he
fro

concern over the years.”

*<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



<https://www.theguardian.com/environment/2017/oct/18/warning-of-ecological-armageddon-after-dramatic-plunge-in-insect-numbers>

Species in Stress

Fungus Infection



Fungus Infection



Fungus Infection



Fungus Infection



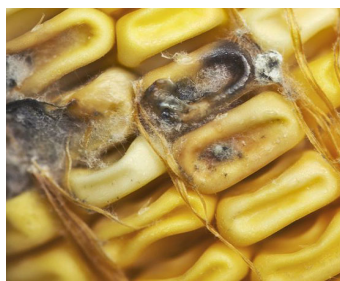
*R. Mason et al., Journal of Environmental Immunology and Toxicology 1:1, 3-12; 2013

Roundup herbicide enhances the growth of aflatoxin-producing fungi*



*Barberis et al., Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Wastes. 2013, 48(12), 1070-1079.

“Aflatoxins are mutagenic, carcinogenic, teratogenic, hepatotoxic, immunosuppressive, and they also inhibit several metabolic systems”*



*Barberis et al., Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Wastes. 2013, 48(12), 1070-1079.

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

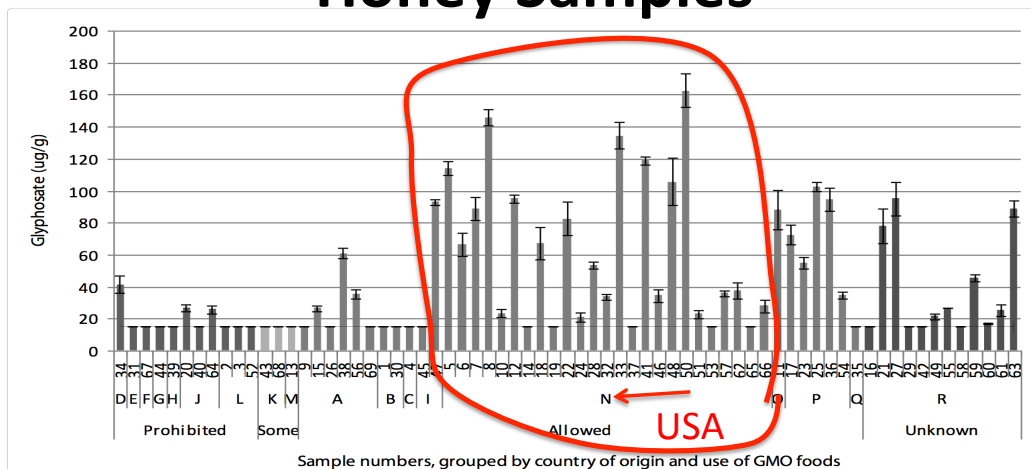
Successful Treatment Protocol for Bees*

- 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



*biomineralstechnologies.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

Superweeds Are Now a Huge Problem*

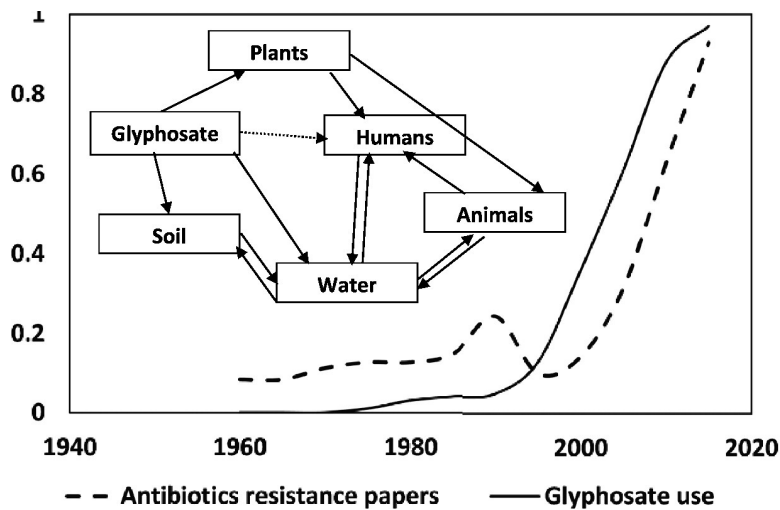
- 76.8% of samples submitted to a U of Illinois Plant Clinic from 10 states across the Midwest showed glyphosate resistance
- “GM crops are on the edge of failure in the U.S. as farmers are asked to fork out more and more money on herbicides to try to control the superweeds. We simply can’t afford it! 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



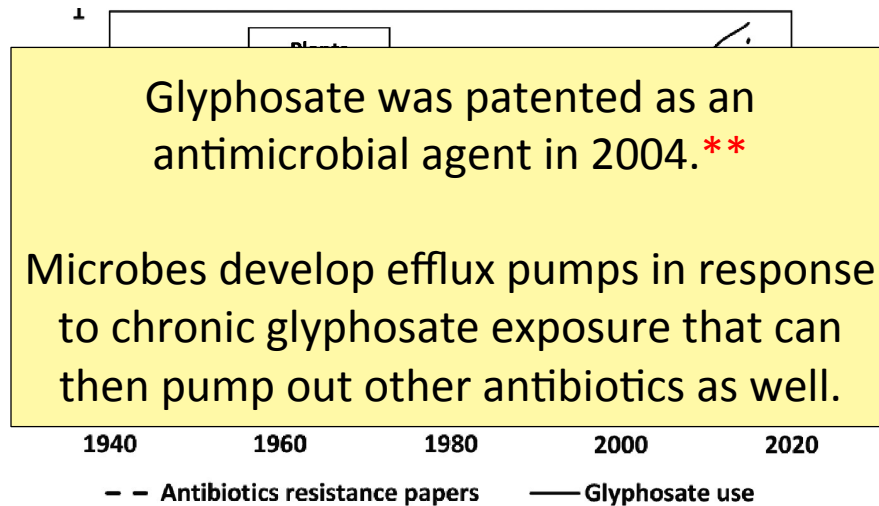
*sustainablepulse.com/2017/02/04/farmers-losing-midwest-superweeds-fight-as-glyphosate-resistance-reaches-over-75/#

Antibiotic Resistance and Glyphosate*



*AHC Van Bruggen et al. Sci Total Environ 2017; 616–617: 255–268.

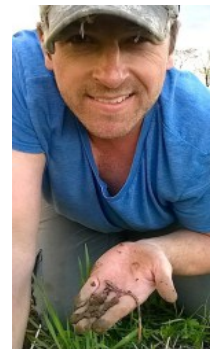
Antibiotic Resistance and Glyphosate*



**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



JR Bollinger

*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.

*<http://www.rutlandherald.com/articles/using-soil-to-fight-climate-change/>

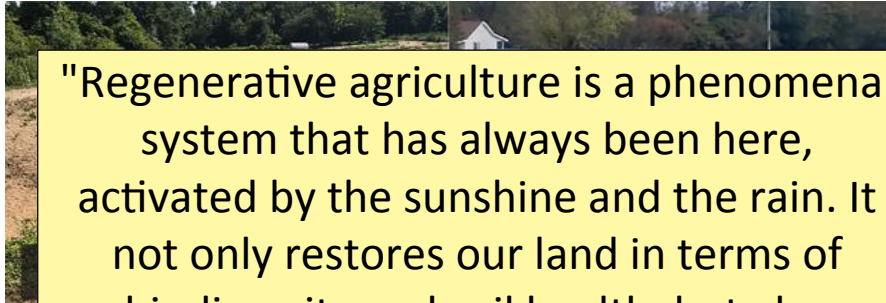
Regenerative Agriculture*



- 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

*<https://joyce-farms.com/blogs/news/joyce-farms-regenerative-agriculture-program-an-introduction>

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 Go
- The mo
- Use adaptive high stock density (AHSD) grazing, the way the bison did it

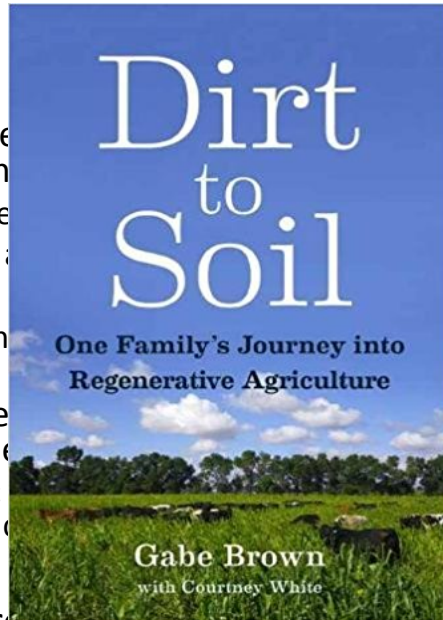
*<https://joyce-farms.com/blogs/news/joyce-farms-regenerative-agriculture-program-an-introduction>

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. Dirt to Soil. Chelsea green Oct. 11, 2018.

- Gabe Brown inherited a farm from his father-in-law that grew wheat, oats and corn
 - His crop failed due to drought
 - He let it lie fallow for three years
 - The soil improved
 - He used less glyphosate because he couldn't afford it
- He eventually converted the farm to a regenerative organic farm, with animals playing a central role
 - Profitable organic products include beef, broilers, pigs, honey, vegetables, fruit, and more



father-in-law that
ars
ed to appear
cause he couldn't
arm, with animals
, broilers, pigs, honey,

*Gabe Brown. *Dirt to Soil*. Chelsea Green Oct. 11, 2018.

Small Organic Farms are the Answer



Bluebird Hill Organic Farm, North Carolina

How to Safeguard Yourself and Your Family



Some Important Nutrients

- Curcumin
- Garlic
- Vitamin C
- Probiotics
- Methyl tetrahydrofolate
- Cobalamin
- Glutathione
- Taurine
- Epsom salt baths



Biochar, Bentonite and Zeolite to maintain healthy microbial distribution in poultry*



*TP Prasai et al. PLoS ONE 11(4): e0154061.

Anecdotal Evidence of Benefits of Fulvic Acid*

"In the last year I have become increasingly sick with ataxia, balance problems, muscle weakness, numbness in the hands and feet and a 'foggy' brain

... To cut a long story short, Jim suggested *Fulvic Acid* as a detox.

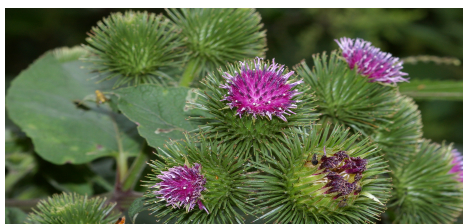
At 10 days the effects started to 'kick in' and by 14 days it was as if a fog had been lifted from my brain. My muscle weakness has gone, I can walk for 2 hours and I can swim in the sea."

"It is a miracle."

*Shared by Nico DaVinci, personal communication concerning a patient

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



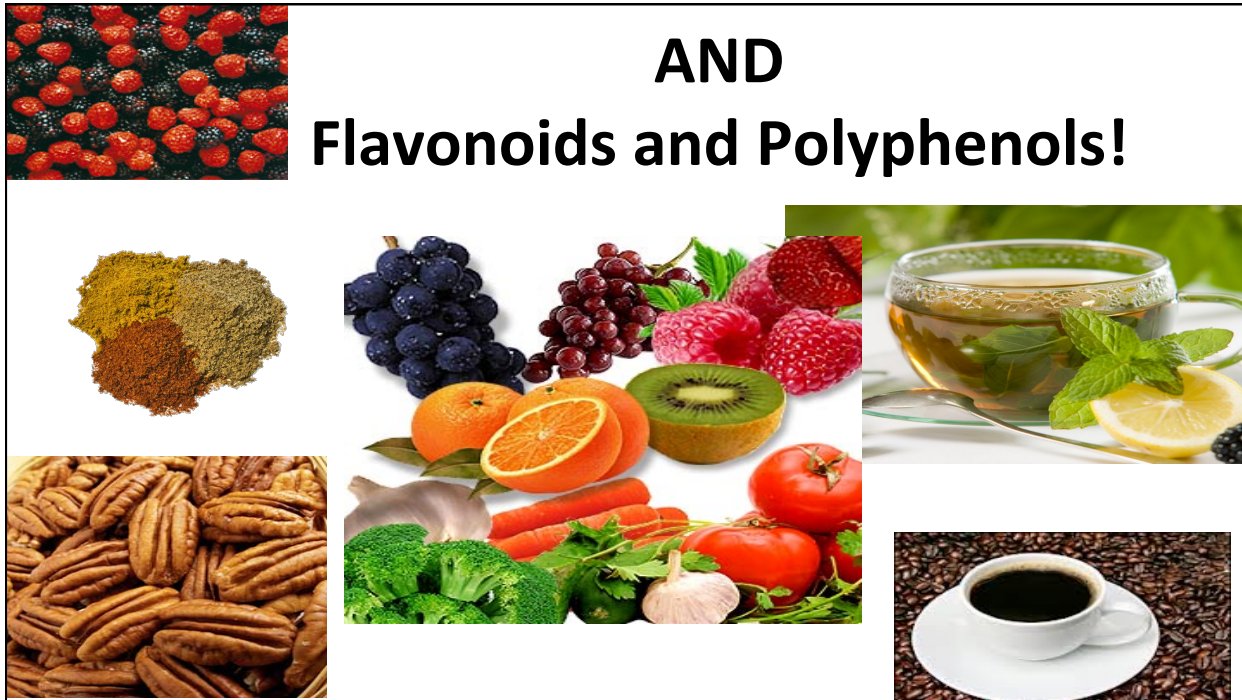
Supplemental Sources of Sulfur*

- glucosamine sulfate
- chondroitin sulfate
- glutathione
- N-acetylcysteine
- alpha lipoic acid
- taurine
- DMSO, MSM
- S-adenosylmethionine (SAME)
- Epsom salts (Mg-sulfate)

These can have many beneficial effects and are nearly nontoxic

My personal favorite is
Epsom salt baths:
Magnesium sulfate uptake
through the skin

*S Parcell, Alternative Medicine Review 7(1), 2002, 22-44



- Sauerkraut and apple cider vinegar contain acetobacter, one of the very few microbes that can metabolize glyphosate
- Yogurt and kimchi probably do too



Recommendations from Dr. Zach Bush*

1. Get out into nature. Walk in the woods, barefoot, feel the sunshine – rich environment, breathe in the nutrients in the air
2. Eat probiotics (naturally fermented foods)
3. Eat organic food
 - Demand is dropping the price.
 - Thrive Market – order online
4. Eat more fruits and vegetables
5. Bathe in natural waters



[*https://www.youtube.com/watch?v=jWgnkgYtqnw&feature=youtu.be](https://www.youtube.com/watch?v=jWgnkgYtqnw&feature=youtu.be)

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