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### Weston Price Fondation Wise Traditions Presentations

- Powerpoint Presentations at the [Weston A. Price Wise Traditions 15th Annual Conference Indianapolis November 7-10, 2014](#).  
Pesticides, Antibiotics, Vaccines and Pharmaceuticals: Are They the Cause of our Current Health Crisis?

1. Nutrition ([Powerpoint Slides](#)) ([PDF Version](#))
2. Pesticides: Focus on Roundup ([Powerpoint Slides](#)) ([PDF Version](#))
3. Vaccines, Antibiotics, and Microbes ([Powerpoint Slides](#)) ([PDF Version](#))
4. Pharmaceutical Drugs: Focus on Statins ([Powerpoint Slides](#)) ([PDF Version](#))

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Drugs.pdf Nutrition.pdf antibiotics\_vaccines.pdf glyphosate\_new.pdf

Drugs.pptx Nutrition.pptx antibiotics\_vaccines.pptx glyphosate\_new.pptx

## Main Outline

- Very brief overview
- Nutrition and health
- **Pesticides: focus on Roundup**
- Vaccines, antibiotics and microbes
- Pharmaceutical drugs: focus on statins

## Roundup, aluminum and hexane: Synergistic partners in the autism epidemic

Stephanie Seneff

MIT CSAIL

Nov. 7, 2014



“We’ve pretty much sacrificed an entire generation of children. The longer we go, the more damage that is going to accumulate.”

Prof. Don Huber

## Half of US Children are Chronically Ill\*

“An estimated 43% of US children (32 million) currently have at least 1 of 20 chronic health conditions assessed, increasing to 54.1% when overweight, obesity, or being at risk for developmental delays are included”

\*Christina D. Bethell et al., Academic Pediatrics 2011, 11(3s); S22-S33

## Outline

- Autism & Glyphosate
- Soy: Why It's Dangerous
- Glyphosate, Aluminum and Vaccines
- Glyphosate and breast cancer
- Bile Acid Disruption by Glyphosate
  - Arsenic toxicity → kidney failure
  - Manganese *toxicity* → Parkinson's disease
  - Manganese *deficiency* → Autism
- Infertility and Birth Malformations
- Summary

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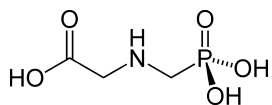
## Brand New Study\*

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

Cynthia D Nevison<sup>1\*</sup>  
 \*Corresponding author  
 Email: Cynthia.Nevison@colorado.edu

- 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.

*\*Environmental Health 2014, 13:73*

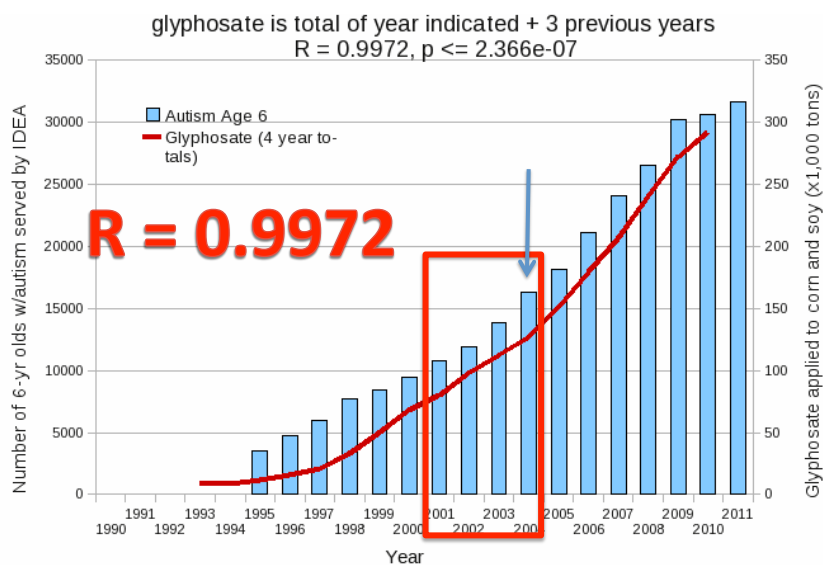


**Glyphosate!!**



- Glyphosate is now the #1 herbicide in use in the U.S. and is increasingly used around the world
  - Developed and patented by Monsanto prior to the 1970's
  - Introduced into the US food chain in 1974
  - Came out from under patent in 2000
- Huge expansion of GMO "Roundup Ready" corn, soy, cotton, sugar beets, tobacco and canola crops has led to sharp increases in the last decade
  - Key issue is glyphosate resistant weeds
- Also used as a desiccant on wheat, sugar cane and other crops

## Autism Prevalence in US: 6 year olds



\*Plot provided by Nancy Swanson, with permission  
 Data sources: autism: US Department of Education; Glyphosate: US Department of Agriculture

## Autism Linked to Oxalate Crystals\*

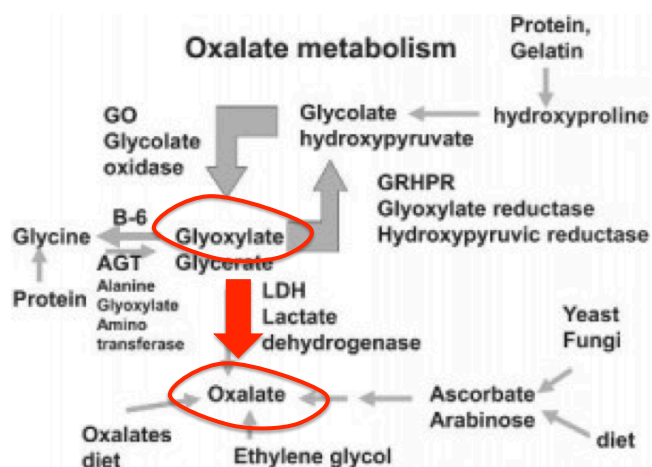
- Crystals of oxalate form kidney stones and cause great discomfort
- Study has shown at least 3-fold higher serum and urinary levels of oxalate in autistic kids\*\*



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

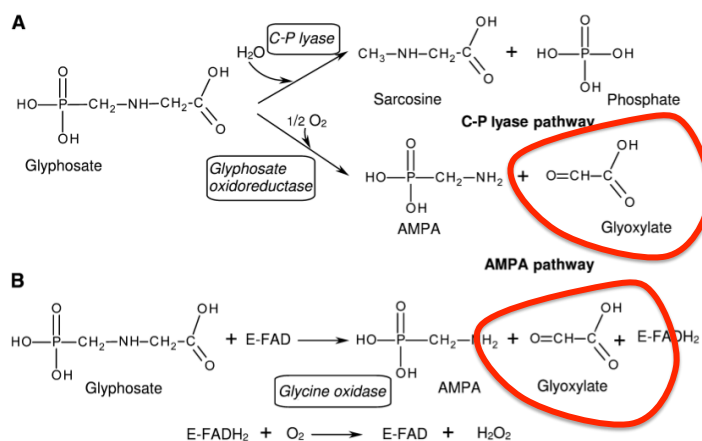
\*\*J Konstantynowicz et al., European Journal of Paediatric Neurology 16(5), 2012, 485-491.

## Oxalate Metabolism\*



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

## Glyphosate Metabolism\*



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

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

“[origin: WO02069718A2] Pesticidal concentrate and spray compositions are described which exhibit *enhanced efficacy* due to the addition thereto of a compound which increases cell membrane permeability, suppresses oxidative burst, or increases expression of hydroxyproline-rich glycoproteins. 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*.”

US007723265B2

Monsanto Technology, St. Louis, MO

(12) United States Patent Xu et al.	(10) Patent No.: (45) Date of Patent:	US 7,723,265 B2 *May 25, 2010
(54) PESTICIDE COMPOSITIONS CONTAINING OXALIC ACID	4,140,513 A 4,129,903 A 4,161,590 A 4,161,602 A 4,315,765 A	2,1979 Prill 2,1979 Beetsman et al. 2,1979 Mueller 2,1979 Mueller 2,1982 Lange
(75) Inventors: Xiaodong C. Xu, Valley Park, MO (US); Ronald J. Reinker, Ellisville, MO (US); Tracy L. Reynolds, Ballwin, MO (US); William Abraham, Wildwood, MO (US); Jeffrey A. Graham, Wildwood, MO (US)	4,405,531 A 4,531,765 A 4,481,026 A 4,507,259 A 4,936,901 A	9,1983 Franz 2,1984 Doshak et al. 11,1984 Pristylia 3,1985 Baker 6,1980 Sargent, Sr. et al.
(73) Assignee: Monsanto Technology, St. Louis, MO (US)	5,118,444 A 5,317,603 A	6,1992 Nguyen 5,1994 Kassebaum et al.

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

“[origin: WO02069718A2] Pesticidal concentrate and spray

con  
due  
cell

Oxalic acid and oxalate are the same thing!

increases expression of hydroxyproline-rich glycoproteins.

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*.”



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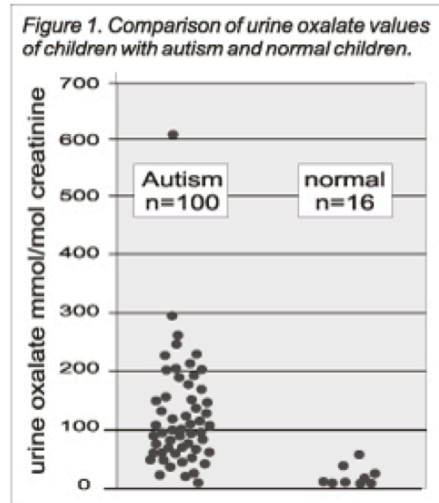
Monsanto Technology, St. Louis, MO



Hypothesis: flooding with oxalate prevents metabolism of glyoxylate to oxalate. Glyoxylate is a very potent glycolating agent, leading to widespread damage

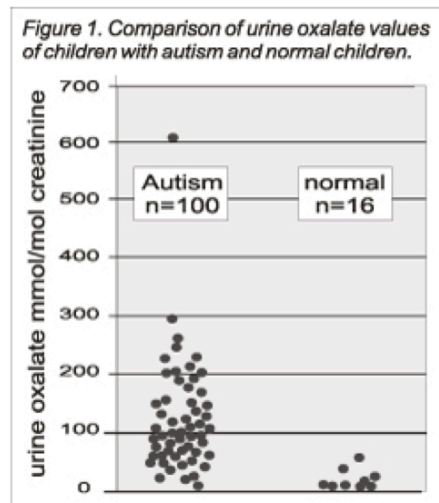


“Oxalate crystals in the bone may crowd out the bone marrow cells, leading to anemia and immunosuppression”\*

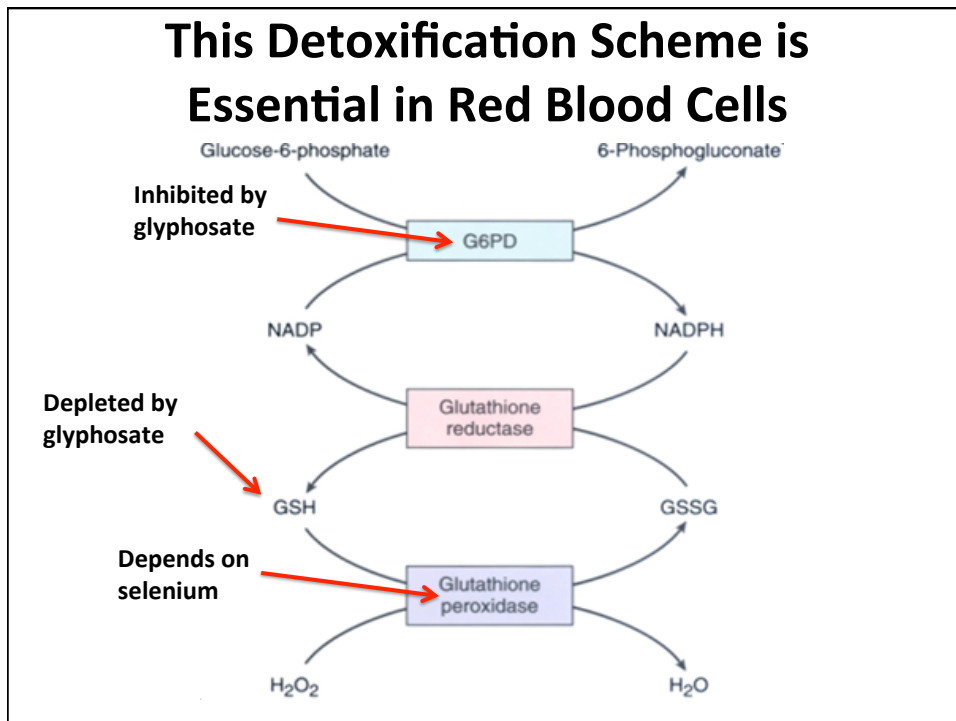
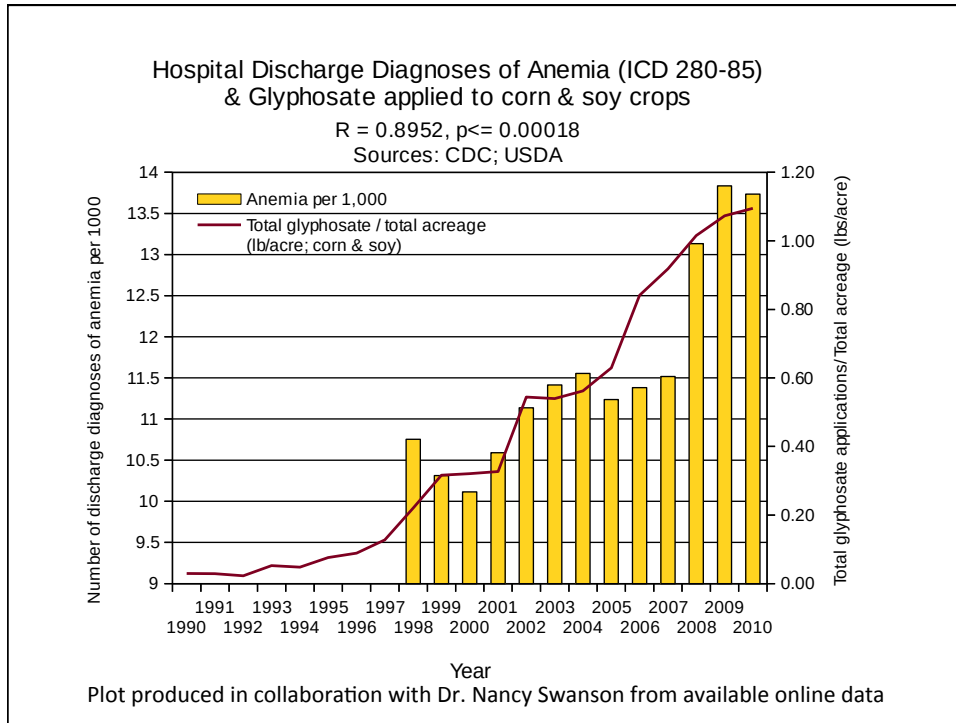


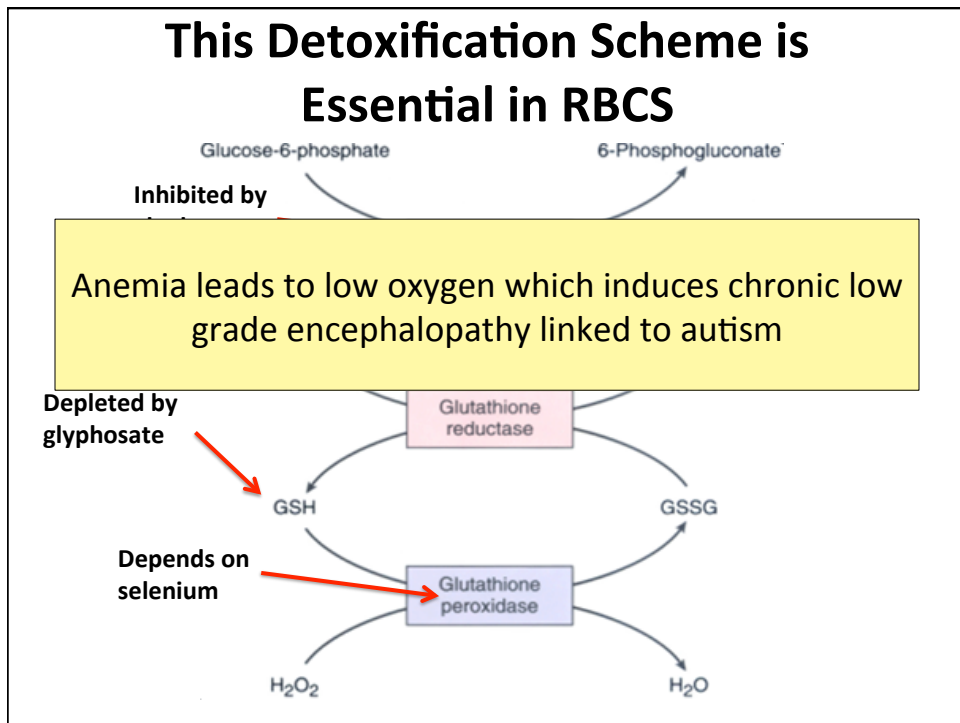
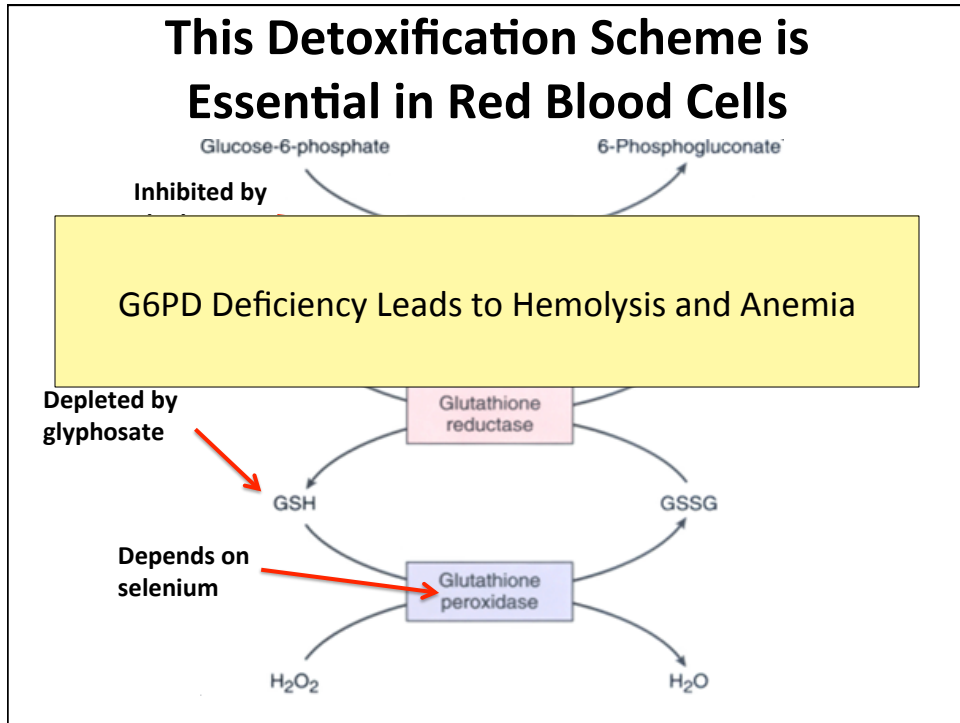
\*<http://www.greatplainslaboratory.com/home/span/oxalates.asp>

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## Outline

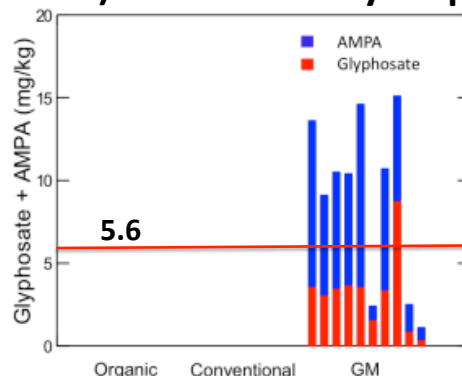
- Autism & Glyphosate
- **Soy: Why It's Dangerous**
- Glyphosate, Aluminum and Vaccines
- Glyphosate and breast cancer
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  - Arsenic toxicity → kidney failure
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## GM soy imports implicated in health issues in China\*

- *Autism rates* have increased 100 times during the past 20 years
- *Parkinson's disease* in China has increased over 20 fold during the last 20 years
- *Infertility* rates have risen sharply:
  - 2012: 15.6%
  - 2002: 8%
  - 1972: 3%

\*[http://blog.sina.com.cn/s/blog\\_502041670102em9z.html](http://blog.sina.com.cn/s/blog_502041670102em9z.html)  
former Vice President of the Academy of Military Science of China

## 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](http://www.greenmedinfo.com/blog/how-extreme-levels-roundup-food-became-industry-normal)

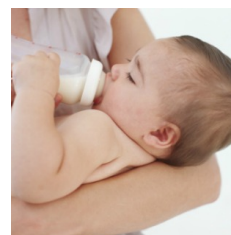
## Soybean Oil and Protein Products\*

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 (and many other products)



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

## 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.

## 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.”\*



\*<http://www.berkeleywellness.com/healthy-eating/food-safety/article/hexane-soy-food>

## Synthetic Food

Liquid Vanilla:

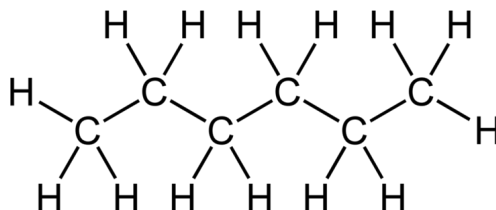
Water, Sugar, **Corn Maltodextrin**, Sodium Caseinate, Milk Protein Concentrate, **Soy Oil, Soy Protein Isolate, Corn Oil**, Potassium Citrate, Calcium Beta-Hydroxy-Beta-Methylbutyrate, **Canola Oil**. Less than 0.5% of the Following: **Whey Protein Concentrate**, Magnesium Phosphate, Natural & Artificial Flavor, Cellulose Gel, **Soy Lecithin**, Sodium Phosphate, Potassium Phosphate, Potassium Chloride, Choline Chloride, Ascorbic Acid, Calcium Carbonate, Cellulose Gum, Carrageenan, Ferrous Sulfate, Salt, dl- Alpha-Tocopheryl Acetate, Gellan Gum, Zinc Sulfate, Niacinamide, Calcium Pantothenate, Manganese Sulfate, Cupric Sulfate, Vitamin A Palmitate, Thiamine Chloride Hydrochloride, Pyridoxine Hydrochloride, Riboflavin, Folic Acid, Chromium Chloride, Biotin, Sodium Molybdate, Sodium Selenate, Potassium Iodide, Phylloquinone, Cyanocobalamin, and Vitamin D3. \*



\*[abbottnutrition.com/brands/products/ensure-muscle-health](http://abbottnutrition.com/brands/products/ensure-muscle-health)

## 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

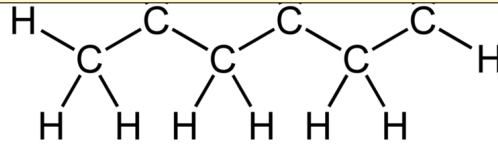


\*N-HEXANE. *Toxicology data network Hazardous Substances Data Bank. US National Library of Medicine*

## Toxic Effects of Inhaled Hexane\*

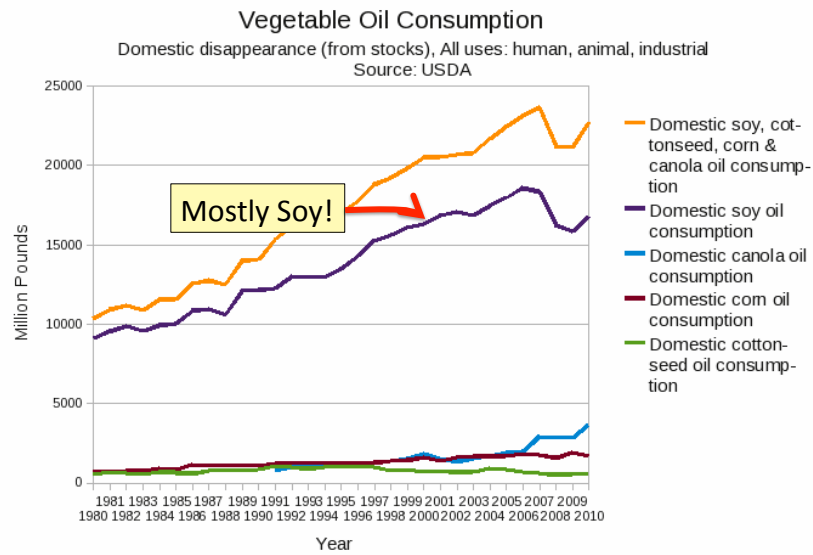
- Low: Dizziness, headache, nausea, vomiting

- High: Death from pulmonary edema
- Hexane allowances in China are much higher than allowances in Europe. ness,  
phy,
- The US does not restrict or measure hexane levels in foods.



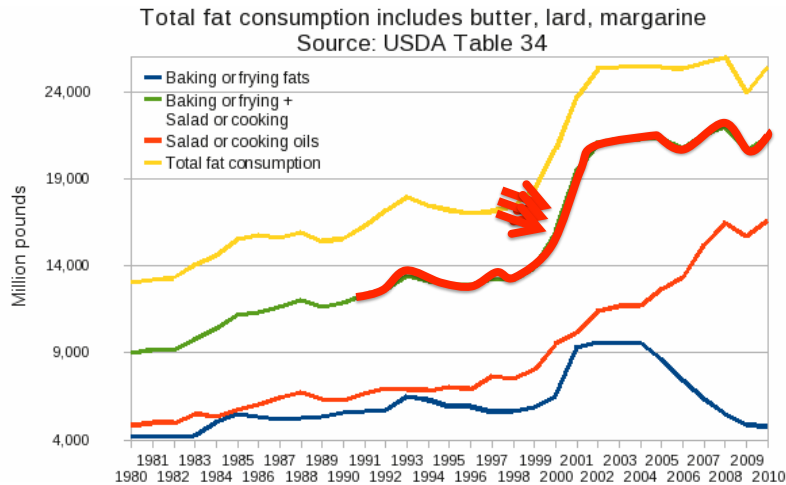
\*N-HEXANE. Toxicology data network Hazardous Substances Data Bank. US National Library of Medicine

## Vegetable Oil Consumption: *All Uses*\*



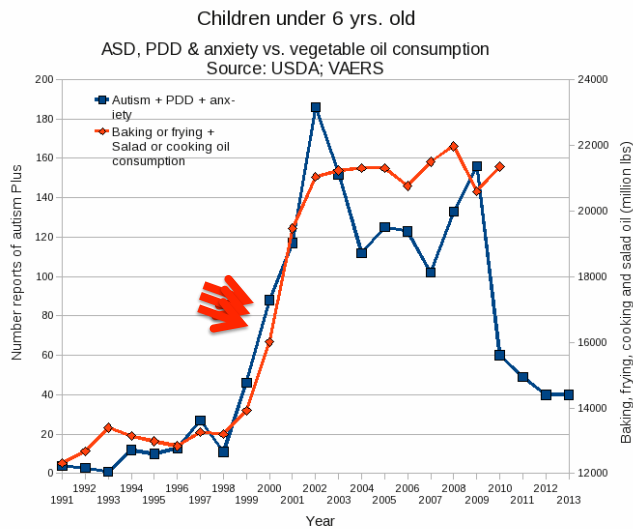


## Human Fat and Oil Consumption: US\*



\*Graphs provided by Dr. Nancy Swanson, with permission

## Baking or Salad + Frying or Cooking Oil Autism, Developmental Delay or Anxiety disorder



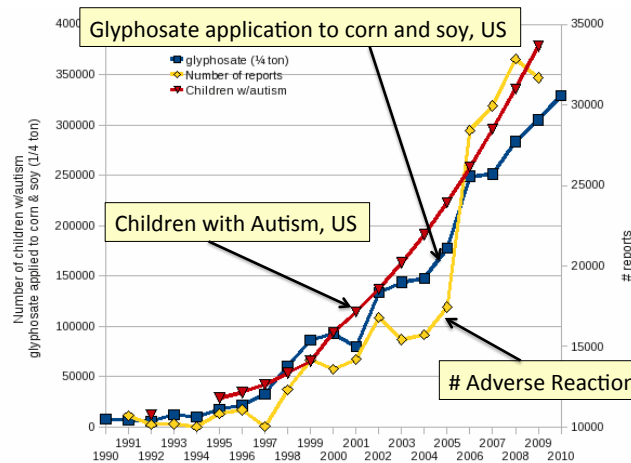
Counts in VAERS database of adverse reaction reports mentioning these conditions

\* Plots provided by Dr. Nancy Swanson with permission

## Outline

- Autism & Glyphosate
- Soy: Why It's Dangerous
- **Glyphosate, Aluminum and Vaccines**
- Glyphosate and breast cancer
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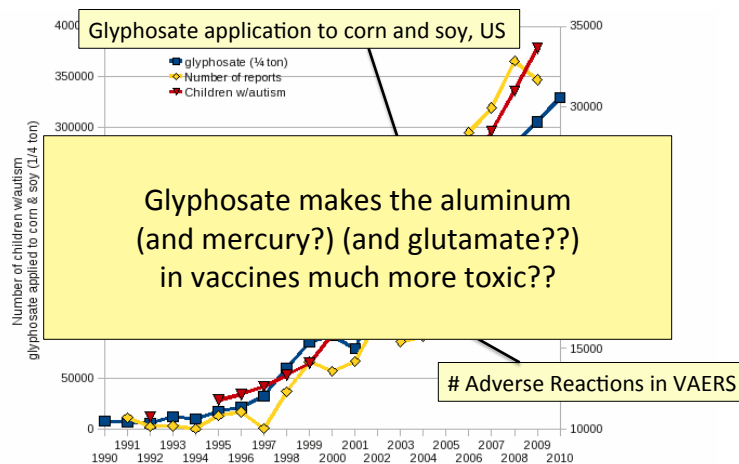
## Autism, Glyphosate, Vaccine Reactions\*



\*Collaboration with Nancy Swanson

MIT Computer Science and Artificial Intelligence Laboratory

## Autism, Glyphosate, Vaccine Reactions\*



\*Collaboration with Nancy Swanson

MIT Computer Science and Artificial Intelligence Laboratory

### Glyphosate enhances aluminum toxicity

### Glyphosate interferes with acetaminophen metabolism

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

OPEN ACCESS

*entropy*

ISSN 1099-4300

www.mdpi.com/journal/entropy

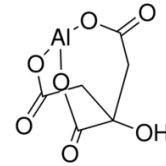
Review

### Empirical Data Confirm Autism Symptoms Related to Aluminum and Acetaminophen Exposure

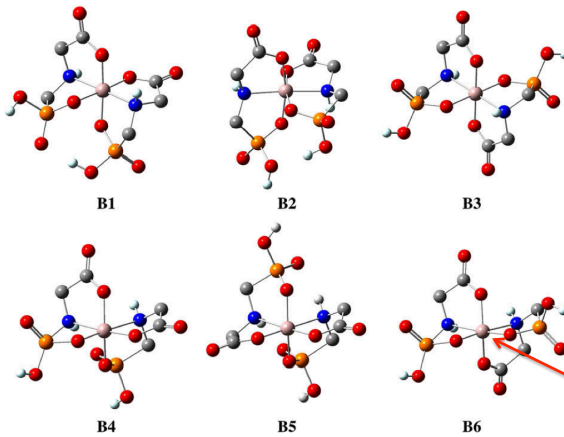
Stephanie Seneff <sup>1,\*</sup>, Robert M. Davidson <sup>2</sup> and Jingjing Liu <sup>1</sup>

# Aluminum Glyphosate\*

Six different ways two glyphosate molecules can chelate aluminum



Aluminum citrate\*\*



ALUMINA

aluminum

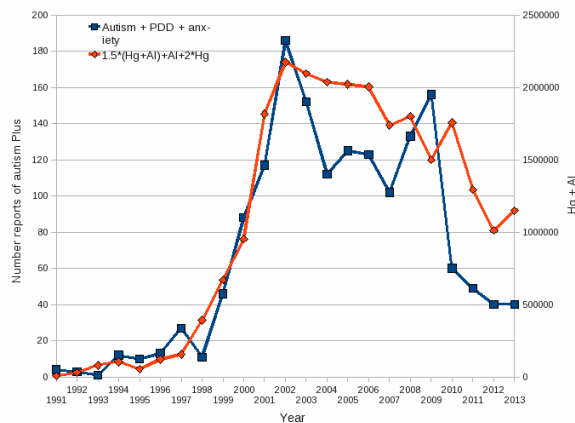
\*M. Purgel et al., Journal of Inorganic Biochemistry 103 (2009) 1426–1438

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

## Aluminum & Mercury

## Autism & Developmental Delay & Anxiety

R = 0.9024, p <= 1.115e-07

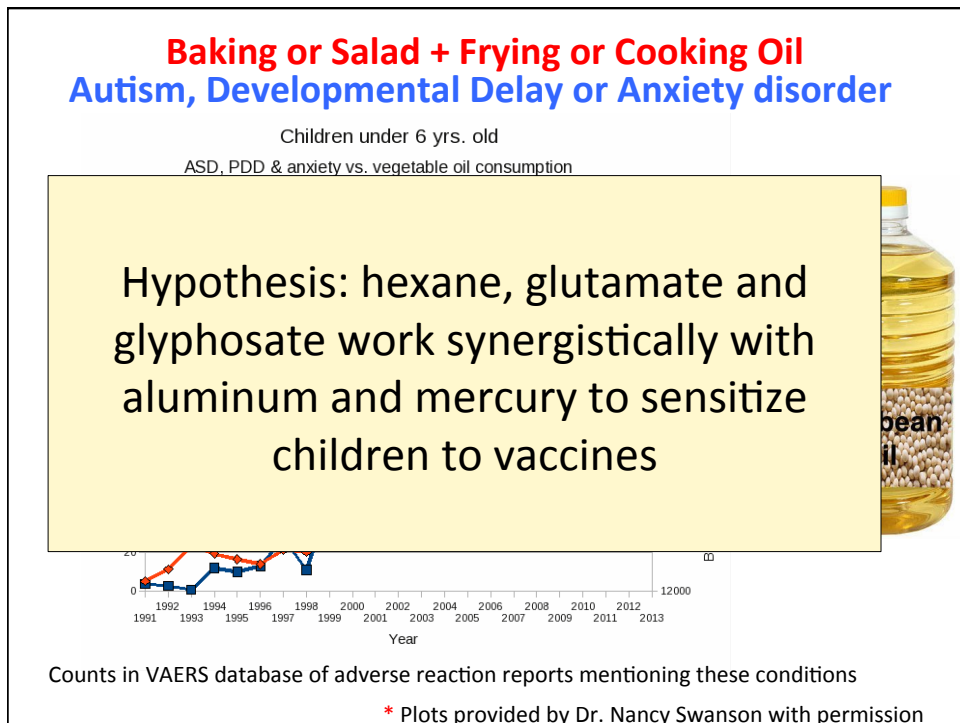
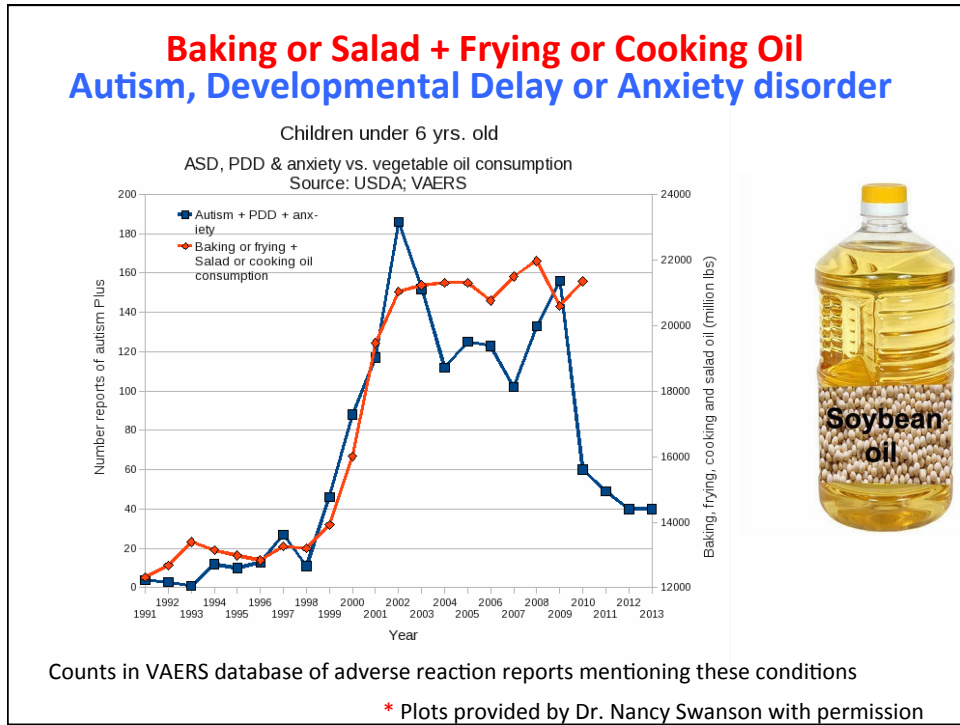


VAERS database

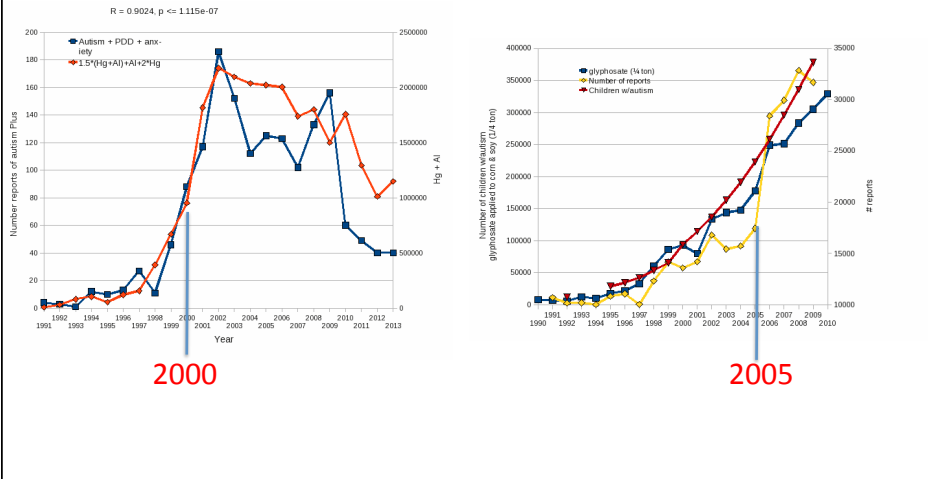
Tabulations from US Vaccine Adverse Event Reporting System (VAERS)

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

\* Plots provided by Dr. Nancy Swanson with permission



## Another Possibility: Modifications to the Surfactant Adjuvants!



### Roundup Brand Leadership Driven by Continuous Innovation

1975	1980	1985	1990	1995	2000	2005
<b>Classic</b> <ul style="list-style-type: none"> <li>Standard for post emergent perennial weed control</li> <li>Improved environmental profile</li> </ul>	<b>Rodeo</b> <ul style="list-style-type: none"> <li>Aquatic market</li> <li>Outstanding environmental profile (licensed to Dow)</li> </ul>	<b>Accord</b> <ul style="list-style-type: none"> <li>Forestry Market</li> <li>Excellent environmental profile (licensed to Dow)</li> </ul>	<b>D-Pak</b> <ul style="list-style-type: none"> <li>Super-high formulation for big volume users in southern U.S.</li> </ul>	<b>Roundup DRYpak</b> <ul style="list-style-type: none"> <li>Solution to packaging issues</li> <li>First of high-load products</li> </ul>	<b>Ultra</b> <ul style="list-style-type: none"> <li>Introduction of 'Transorb technology'</li> <li>Safe on Roundup Ready crops</li> </ul>	<b>Ultra Max</b> <ul style="list-style-type: none"> <li>High load version of Ultra</li> <li>Excellent Roundup Ready crop safety</li> </ul>
<b>Weather Max</b> <ul style="list-style-type: none"> <li>Transorb II technology</li> <li>+50% more concentrated</li> <li>Rainfast warranty</li> <li>Best Roundup Ready crop safety to date</li> </ul>						

**Active Ingredient Loading (g/L glyphosate)**

Product	Active Ingredient Loading (g/L glyphosate)
Roundup Original, RT, Ultra	~350
Roundup CT (AUS), UltraMAX (US)	~450
Roundup WeatherMAX	~550

- 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](http://sec.gov/Archives/edgar/data/1110783/000103570403000400/c77652exv99w2.htm)

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

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

**\*JANUARY 3, 2005**

## **The Enhancing Effect of Adjuvants\***

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

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

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## Glyphosate is an endocrine disruptor that promotes breast cancer\*

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



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



## **Glyphosate 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

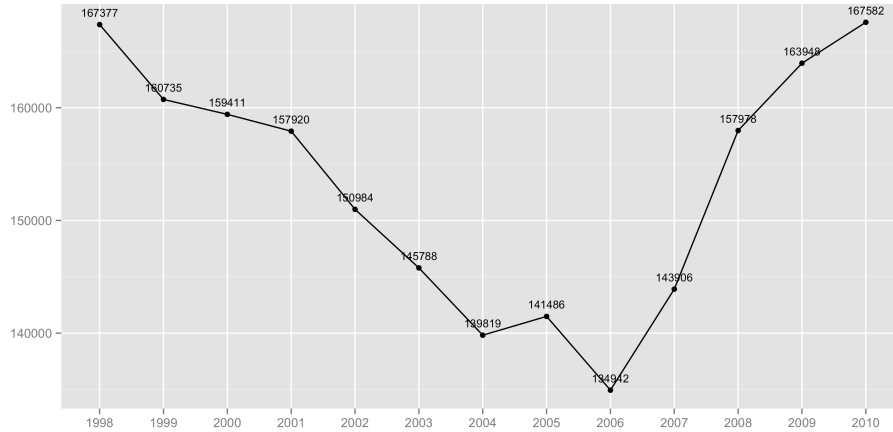
## **Glyphosate Test Report: Findings in American Mother's Breast milk, urine and water\***

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- Monsanto is wrong regarding bioaccumulation

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

If it's in the breast milk  
then it is in the breast!

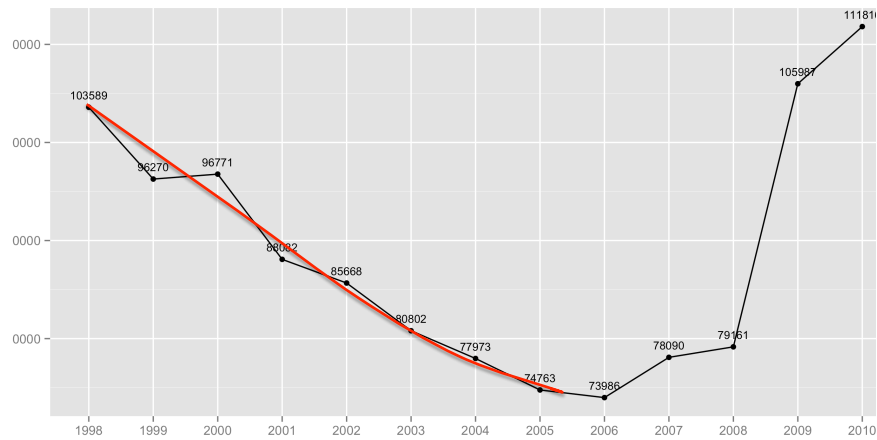
## CDC Hospital Discharge Data on Breast Cancer Trends\*



Collaboration with Dr. Chen Li and Dr. Nancy Swanson

\*ICD9 codes 174-175 , [ftp://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Datasets/NHDS](ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NHDS)

## Same Data: Caucasians Only\*



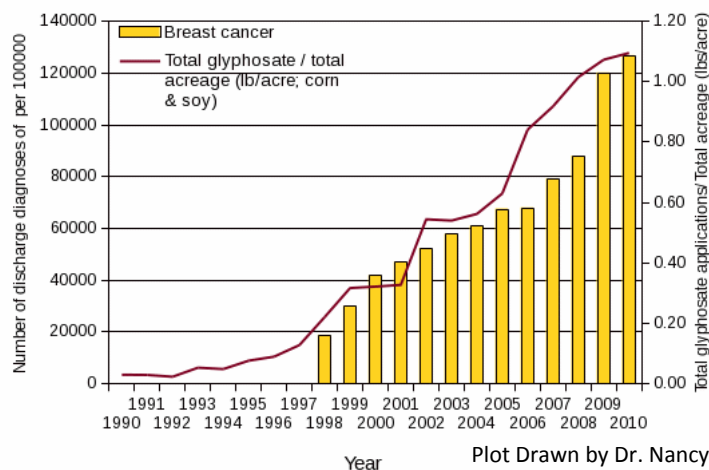
\*ICD9 codes 174-175 , [ftp://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Datasets/NHDS](ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NHDS)

## Once Estrogen Model Is Subtracted ...

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

$R = 0.9375, p < 0.0001132$

Sources: CDC, USDA



\*ICD9 codes 174-175, [ftp://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Datasets/NHDS](ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NHDS)

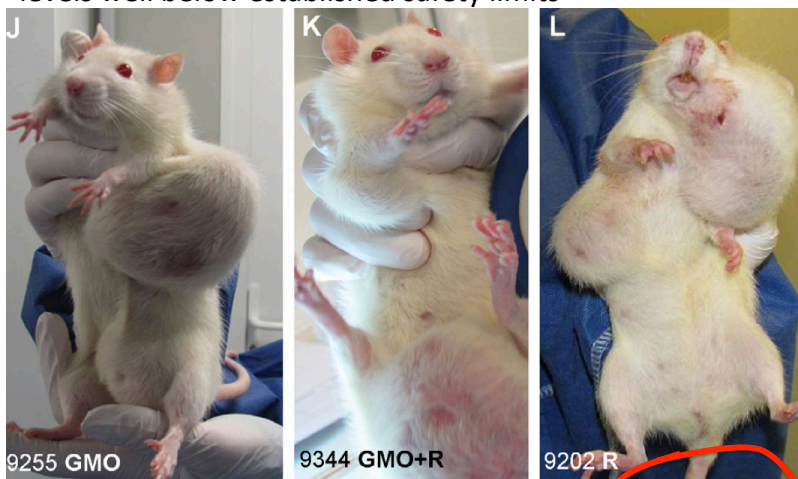
## Roundup Disrupts Steroid Synthesis\*

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

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

## Mammary Tumors in Rats\*,\*\*

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



\*G.-E. Séralini et al., Food Chem. Toxicol. (2011) [retracted]

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

Séralini et al. *Environmental Sciences Europe* 2014, **26**:14  
<http://www.enveurope.com/content/26/1/14>

 Environmental Sciences Europe  
 a SpringerOpen Journal

RESEARCH

Open Access

### Republished study: long-term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize

Gilles-Eric Séralini<sup>1\*</sup>, Emilie Clair<sup>1</sup>, Robin Mesnage<sup>1</sup>, Steeve Gress<sup>1</sup>, Nicolas Defarge<sup>1</sup>, Manuela Malatesta<sup>2</sup>,  
 Didier Hennequin<sup>3</sup> and Joël Spiroux de Vendômois<sup>1</sup>

Séralini et al. *Environmental Sciences Europe* 2014, **26**:13  
<http://www.enveurope.com/content/26/1/13>

 Environmental Sciences Europe  
 a SpringerOpen Journal

COMMENTARY

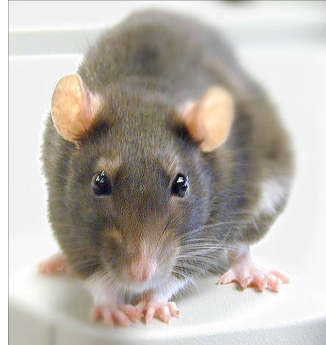
Open Access

### Conflicts of interests, confidentiality and censorship in health risk assessment: the example of an herbicide and a GMO

Gilles-Eric Séralini<sup>1,2\*</sup>, Robin Mesnage<sup>1,2</sup>, Nicolas Defarge<sup>1,2</sup> and Joël Spiroux de Vendômois<sup>2</sup>

## Conclusions from Rat Study \*

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



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

## Outline

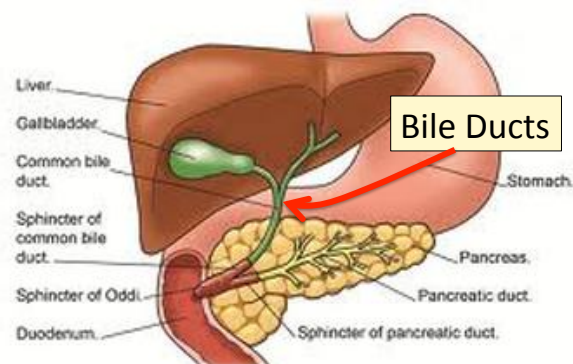
- Autism & Glyphosate
- Soy: Why It's Dangerous
- Glyphosate, Aluminum and Vaccines
- Glyphosate and breast cancer
- **Bile Acid Disruption by Glyphosate**
  - Arsenic toxicity → kidney failure
  - Manganese *toxicity* → Parkinson's disease
  - Manganese *deficiency* → Autism
- Infertility and Birth Malformations
- Summary

“Biliary excretion may be a major homeostatic mechanism for preventing both *deficiency* and *toxicity* of manganese.”\*

\*Malechki et al., J Nutr 126(2): 489-98, 1996.

## Studies on Glyphosate Exposure to Karp (Fish) in Africa\*

“The changes in liver tissues are congestion of sinusoids, congestion of central vein and proliferation of the *bile ductular epithelium*.”

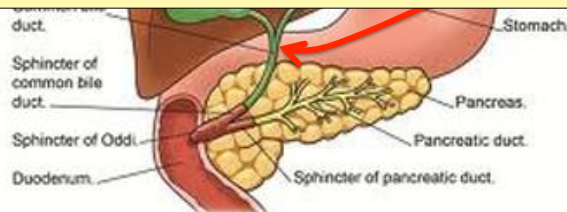


\*K. Ramah, African Journal of Biotechnology 10(7), 1112-1116, 14 Feb. 2011

## Studies on Glyphosate Exposure to Karp (Fish) in Africa\*

“The changes in liver tissues are congestion of sinusoids, congestion of central vein and proliferation of the *bile ductular epithelium*”

Proliferating bile epithelial cells are a major source of growth factors leading to liver fibrosis\*\*



\*K. Ramani, African Journal of Biotechnology 10(7), 1112-1116, 14 Feb. 2011.

\*\*N Sedlacek et al., Am J Pathol 158(4):1239-44, 2001.

## What Does This Mean?

- Hypothesis: bile flow is impeded because the bile acids are not converted to the more hydrophilic form that allows them to flow
  - Likely due to inhibition of the many cytochrome P450 enzymes that oxidize bile acids
  - This will lead to impaired metabolism of fats
- Unoxidized bile acids are toxic to the liver
- Both manganese and arsenic are exported through the bile acids
  - Impaired export leads to their accumulation in liver

## Outline

- Autism & Glyphosate
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- Infertility and Birth Malformations
- Summary

## Arsenic Export Through Bile Acids\*

- Arsenic (a toxic metal) is removed from the body through two paths: biliary excretion by the liver and urinary excretion in the kidney
- The biliary path depends critically upon glutathione bioavailability
- Glutathione is depleted in the liver by glyphosate



\*Z. Gregus et al. Toxicol Sci. 2000 Jul;56(1):18-25.



*Int. J. Environ. Res. Public Health* **2014**, *11*, 2125-2147; doi:10.3390/ijerph110202125

**OPEN ACCESS**

Sri Lanka is the first country to ban glyphosate

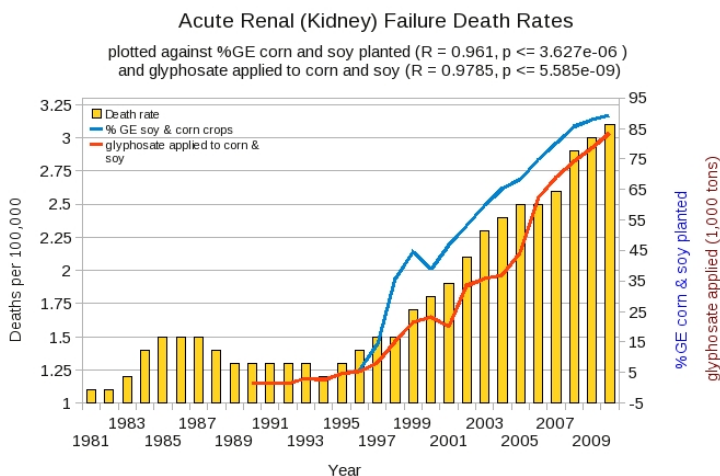
International Journal of Environmental Research and Public Health  
 ISSN 1660-4601  
 www.mdpi.com/journal/ijerph

*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**

This problem did not exist in Sri Lanka prior to the 1990s.

## Acute Kidney Disease Death Rate in US Plotted Against Glyphosate and GMOs\*



\*Plot prepared by Nancy Swanson from available data online

## Outline

- Autism & Glyphosate
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- Infertility and Birth Malformations
- Summary

## Manganese, Bilirubin, and Cholestasis

- A mouse model of cholestasis (blocked bile flow) can be induced by exposure to manganese and bilirubin\*
- Glyphosate increases the release of bilirubin\*\*
- Bilirubinemia in neonates is a risk factor for autism\*\*\*

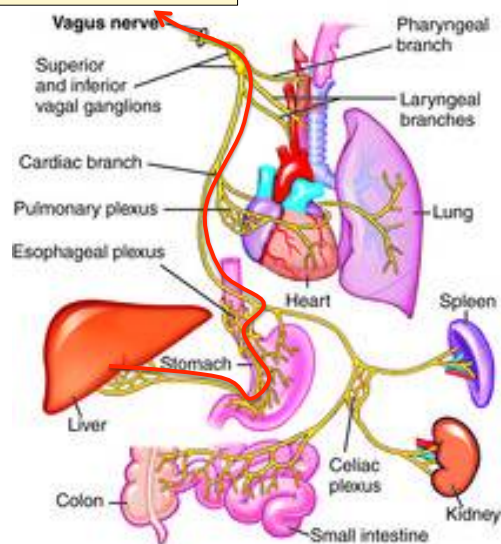
\*MY Akoume et al., Toxicol Sci 73: 378-385, 2003.

\*\*FO Okonkwo et al., Pakistan Journal of Biological Sciences 16(18): 939-944, 2013.

\*\*\*M Kaplan et al., J Pediatr 128(5 Pt 1): 695-7 1996.

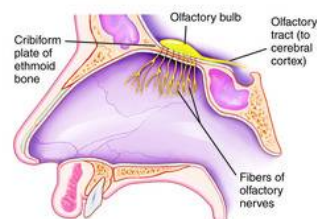
## Where Does the Manganese Go?

### Brainstem Nuclei



## “Manganism” in Welders\*

- Manganese-containing nanoparticles breathed in through the nose are taken up into the central nervous system
  - A key pathway is via the olfactory tract, directly to the brain stem nuclei
- Manganese, unlike most other metals, can travel across synapses and then along connecting axons to spread eventually to distant regions of the brain



\*RG Lucchini et al. Neuromolecular Med. 2009;11(4):311-21

## “Manganism” in Welders\*

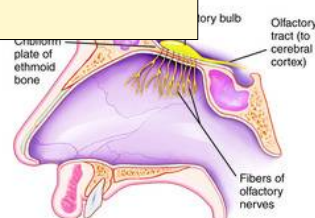
- Manganese-containing nanoparticles breathed in through the nose are taken up into the olfactory system

– A key pathway is the olfactory bulb

The pathology is very similar to Parkinson’s disease



- Manganese, like other metals, can travel across synapses and then along connecting axons to spread eventually to distant regions of the brain



\*RG Lucchini et al. Neuromolecular Med. 2009;11(4):311-21

## C. elegans Study: Parkinsons Disease\*

- Chronic exposure to Touchdown (a glyphosate-containing herbicide) led to degeneration of dopaminergic and GABAergic neurons [in brainstem nuclei]
- A manganese-containing fungicide also damaged these neurons



\*R. Negga et al. Neurotox Res. 2012 April ; 21(3): 281–290.

## Parkinson's Disease Following Glyphosate Accident (Acute Exposure)\*

- 52 year old man developed Parkinsonian symptoms just one month following accidental spill of glyphosate product onto skin – remained in skin contact for 30 minutes
- Hyperintense signal in globus pallidus and substantia nigra (indicative of manganese accumulation in brainstem nuclei)

\*ER Barbosa et al., Mov Disord 16(3): 565-8, 2001.

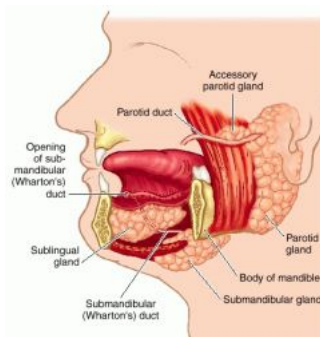
## Parkinsonism after *Chronic* Exposure to Glyphosate\*

- 44 year old woman experienced rigidity, slowness and resting tremor
  - She worked for previous 3 years in the glyphosate manufacturing section of a chemical factory in China
  - MRI showed hyperintense signal in substantia nigra

\*G Wang et al., Parkinsonism Relat Disord. 2011 Jul;17(6):486-7.

## Arsenic Poisoning\* and Manganese Poisoning\*\* Induce Intense Salivation

And manganese levels in saliva are a good indicator of manganese toxicity in occupationally exposed individuals (welders)\*\*\*

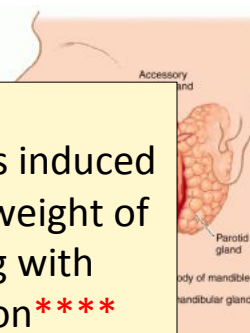


- \*LA Selby et al., Environmental Health Perspectives 19,183-189, 1977.
- \*\*K Shuqin et al. British Journal of Industrial Medicine 1992 49: 66-69.
- \*\*\*Wang et al. Toxicol Lett. 2008 Jan 4;176(1):40-7.

## Arsenic Poisoning\* and Manganese Poisoning\*\* Induce Intense Salivation

And manganese levels in saliva of man occupationally exposed individuals

Glyphosate exposure to rats induced a dramatic increase in the weight of the salivary glands along with impaired liver/bile function\*\*\*\*



- \*LA Selby et al., Environmental Health Perspectives 19,183-189, 1977.
- \*\*K Shuqin et al. British Journal of Industrial Medicine 1992 49: 66-69.
- \*\*\*Wang et al. Toxicol Lett. 2008 Jan 4;176(1):40-7.
- \*\*\*\*P Chan and J Mahler, Toxicity Report Series 16:1-D3, 1992.

## Salivary Glands Damaged by Glyphosate\*

“A *no-effect level* for cytoplasmic alteration of the parotid and submandibular salivary glands in this study *was not reached.*”

**TABLE 6** Incidence and Severity of Cytoplasmic Alteration of the Parotid and Submandibular Salivary Glands (combined) in F344/N Rats in the 13-Week Dosed Feed Study of Glyphosate

Dose (ppm)	0	3125	6250	12500	25000	50000
MALES	0/10	6/10 (1.0)*	10/10 (1.0)	10/10 (1.8)	10/10 (2.7)	10/10 (2.9)
FEMALES	0/10	8/10 (1.0)	10/10 (1.0)	10/10 (2.1)	10/10 (2.4)	10/10 (3.0)

\*PC Chan, and JF Mahler, NTP Technical Report on Toxicity Studies of Glyphosate, National Toxicology Program, Toxicity Reports Series Number 16, NIH Publication 92-3135, July 1992. Table 6: p. 24

## Outline

- Autism & Glyphosate
- Soy: Why It's Dangerous
- Glyphosate, Aluminum and Vaccines
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“The mechanism by which glyphosate disrupts the EPSPS enzyme in plants and microorganism is by chelating the *manganese* metal co-factor of this enzyme. In other words it steals the ‘ignition key’ of the enzyme.”

Dr. Arden Andersen, D.O.,  
Food Plague Primer: Glyphosate and Genetically Engineered Crops

“Fundamentally **the herbicidal effect of glyphosate is ultimately due to soil pathogens** gaining access to the “weed” thanks to glyphosate’s weakening of the plant and killing of beneficial microbes *by the chelation of manganese* and other trace elements.”

Dr. Arden Andersen, D.O.,  
Food Plague Primer: Glyphosate and Genetically Engineered Crops



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This is analogous to glyphosate’s effect on gut bacteria: killing the beneficial bacteria and allowing the pathogens to overgrow

Dr. Arden Andersen, D.O.,  
Food Plague Primer: Glyphosate and Genetically Engineered Crops

### Glyphosate Depletes Iron, Manganese and Zinc in Plants\*

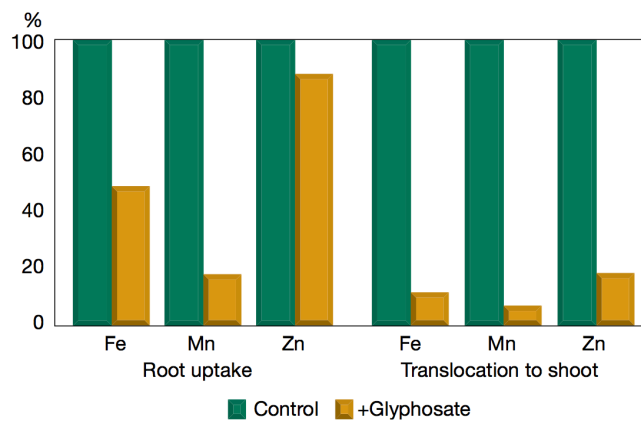
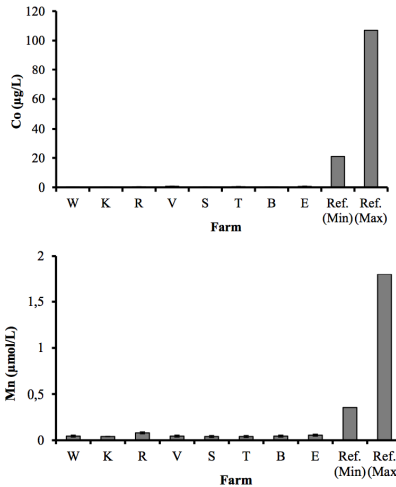


Figure 1. Effect of glyphosate\* on nutrient uptake and translocation by “non-target” plants, Eker, et al. 2006. (\* 2.5% of recommended herbicidal rate of glyphosate.)

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

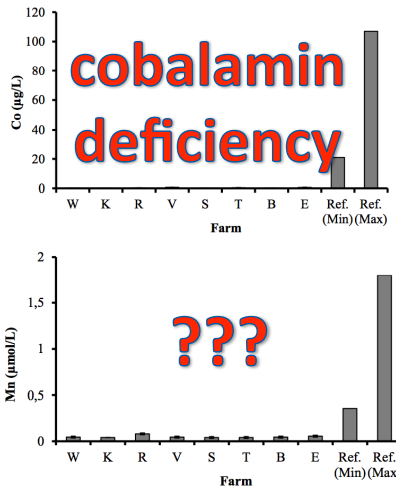
## Severe Deficiency in Serum Manganese and Cobalt in Cows\*



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

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

## Severe Deficiency in Serum Manganese and Cobalt in Cows\*



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## Sub-Outline

### Glyphosate and manganese deficiency

- *Lactobacillus* and anxiety
- Glutamate and ammonia
- Mitochondrial disorder
- Impaired bone development

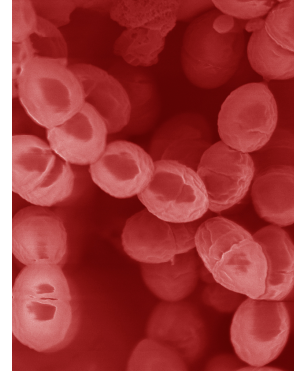
## Glyphosate Kills Beneficial Bacteria\*

- Examined effect of glyphosate and Roundup on three food microorganisms widely used as starters in dairy technologies
  - Two are species of *Lactobacillus*
- Roundup is always more potent than glyphosate, and in all cases, toxic from levels 10–100 times below the lowest agricultural uses (10,000 ppm).
- Unpredictable consequences of Roundup on soil microorganisms have to be considered

\*E Clair et al. Curr Microbiol (2012) 64:486–491

## Lactobacillus Depends on Manganese!\*

- Many lactic acid bacteria contain very high intracellular manganese levels
  - Scavenges toxic oxygen species, particularly superoxide
- Manganese deprivation suppresses growth

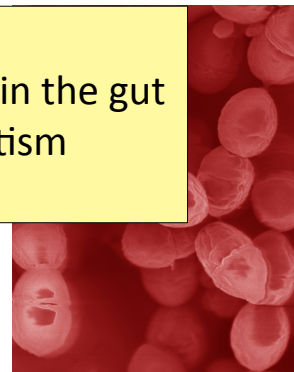


\* FS Archibald and M-N Duong. Journal of Bacteriology Apr 1084, 1-8.

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  - Scavenges toxic oxygen species, particularly superoxide
- Manganese deprivation suppresses growth

Lactobacillus levels are low in the gut in association with autism



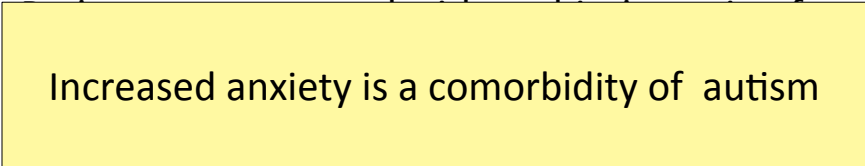
\* FS Archibald and M-N Duong. Journal of Bacteriology Apr 1084, 1-8.

## Lactobacillus Alleviate Anxiety\*

- Patients suffered from chronic fatigue syndrome and associated anxiety
- Patients were treated with probiotic strain of Lactobacillus (control group got a placebo)
- Significant rise in both Lactobacillus and Bifidobacteria in gut
- Significant decrease in anxiety symptoms ( $p = 0.01$ )
- Supports concept of gut-brain axis (communicate with brain via vagal nerve)

\*R Av et al. Gut Pathog. 2009 Mar 19;1(1):6. doi: 10.1186/1757-4749-1-6.

## Lactobacillus Alleviate Anxiety\*

- Patients suffered from chronic fatigue syndrome and associated anxiety
-  Increased anxiety is a comorbidity of autism
- Significant decrease in anxiety symptoms ( $p = 0.01$ )
- Supports concept of gut-brain axis (communicate with brain via vagal nerve)

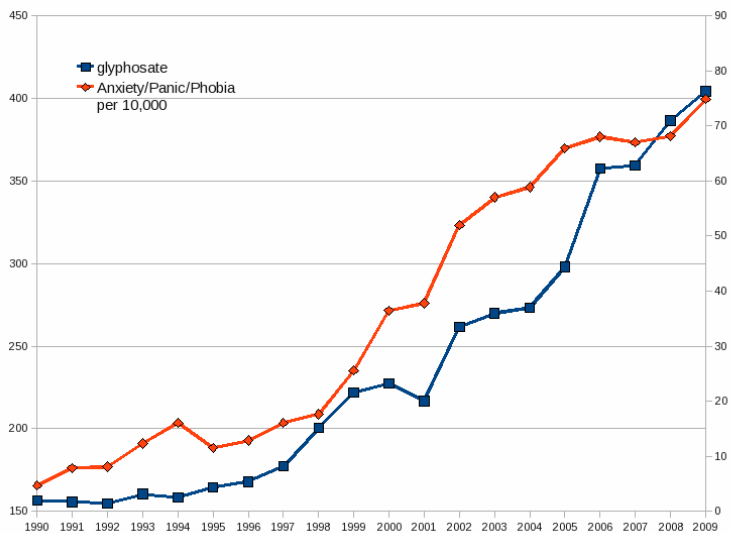
\*R Av et al. Gut Pathog. 2009 Mar 19;1(1):6. doi: 10.1186/1757-4749-1-6.

## Anxiety and Autism\*

- Specific Phobia: 30%
- Obsessive-Compulsive Disorder: 17%
- Social Anxiety Disorder/Agoraphobia: 17%
- Generalized Anxiety Disorder: 15%
- Separation Anxiety Disorder: 9 %
- Panic Disorder: 2%

\*Van Steensel, F.J.A., Bogels, S.M., & Perrin, S. (2011). Anxiety disorders in children and adolescents with autistic spectrum disorders: A meta-analysis. *Clinical Child and Family Psychology Review*, 14, 302-317.

## Glyphosate Application on Corn and Soy Plotted against Anxiety, Panic Disorder and Phobias\*



\*Plots provided by Dr. Nancy Swanson

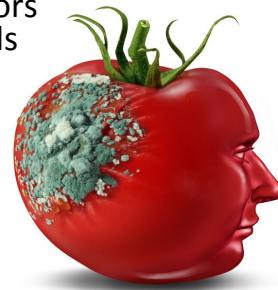
## Sub-Outline

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- Lactobacillus and anxiety
- **Glutamate and ammonia**
- Mitochondrial disorder
- Impaired bone development

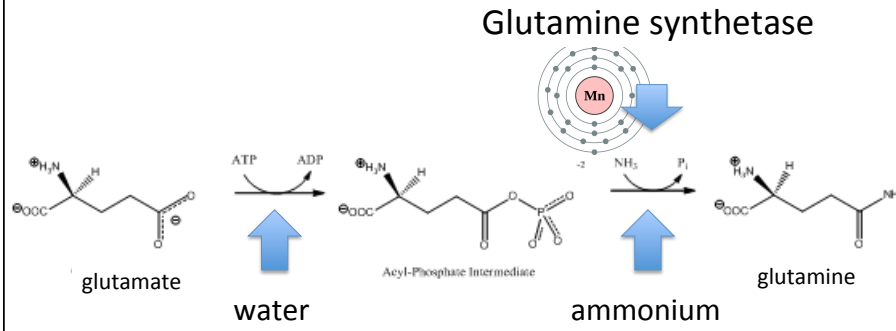
## Glyphosate and Glutamate\*

- Acute exposure activates NMDA receptors and voltage-dependent calcium channels
  - Oxidative stress and neural cell death
  - Increased glutamate release into the synaptic cleft → *excessive extracellular glutamate levels*
  - Decreased glutathione content
  - Increased peroxidation of lipids (fats)
- Chronic exposure:
  - Decreased glutamate uptake and metabolism
  - Induced calcium uptake
  - Induced oxidative stress



\*<http://www.greenmedinfo.com/blog/roundup-weedkiller-brain-damaging-neurotoxin>

## Glutamine Synthesis Depends on Manganese!



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

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

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

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

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

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



## Journal of Personal Science: One Child's Autism Eliminated by Removal of Glutamate From Her Diet\* By Katherine Reid

First Round:

- Kale, cucumber, cilantro, nuts, seeds, fruits
- Magnesium B-complex, vitamin D3, omega 3 fats (EPA, DHA)
- Probiotics
- Gluten free and casein free (no wheat, no milk)

*Child improved significantly but still had autistic behaviors*

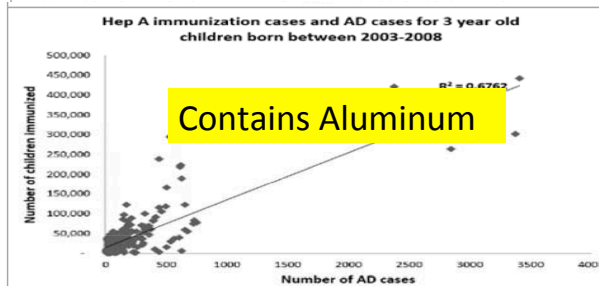
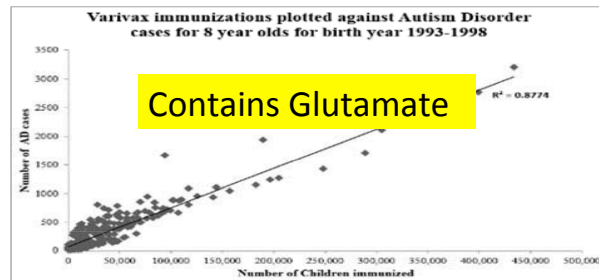
Second Round:

- ADD: ELIMINATE FREE GLUTAMATE

*Child lost the "autism" label!*

\*[blog.sethroberts.net/2013/05/17/journal-of-personal-science-one-childs-autism-eliminated-by-removal-of-glutamate-from-her-diet](http://blog.sethroberts.net/2013/05/17/journal-of-personal-science-one-childs-autism-eliminated-by-removal-of-glutamate-from-her-diet)

## Varivax and Hepatitis A Vaccines: Linked to Autism\*



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

## Sub-Outline

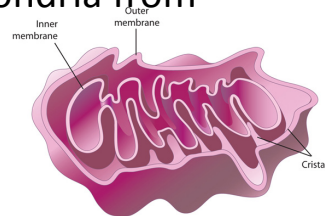
### Glyphosate and manganese deficiency

- Lactobacillus and anxiety
- Glutamate and ammonia
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- Impaired bone development

## Autism and Mitochondrial Disorder\*

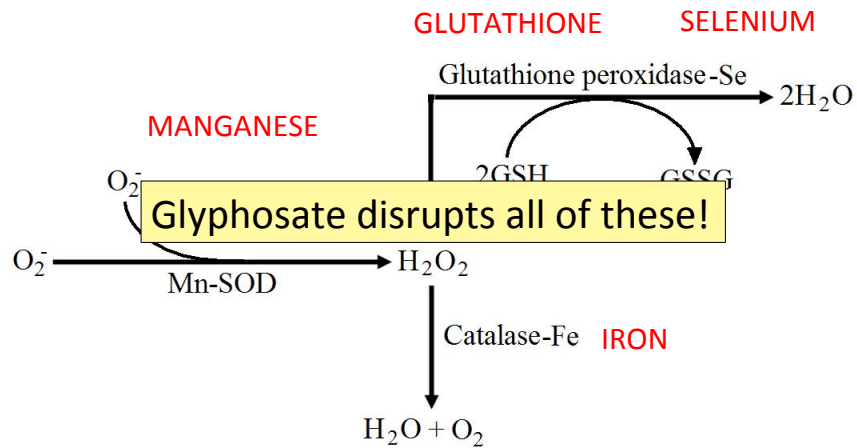
“Five of 11 patients studied were classified with definite mitochondrial respiratory chain disorder, suggesting that this might be one of the most common disorders associated with autism”

**Manganese** superoxide dismutase plays a critical role in protecting mitochondria from oxidative damage

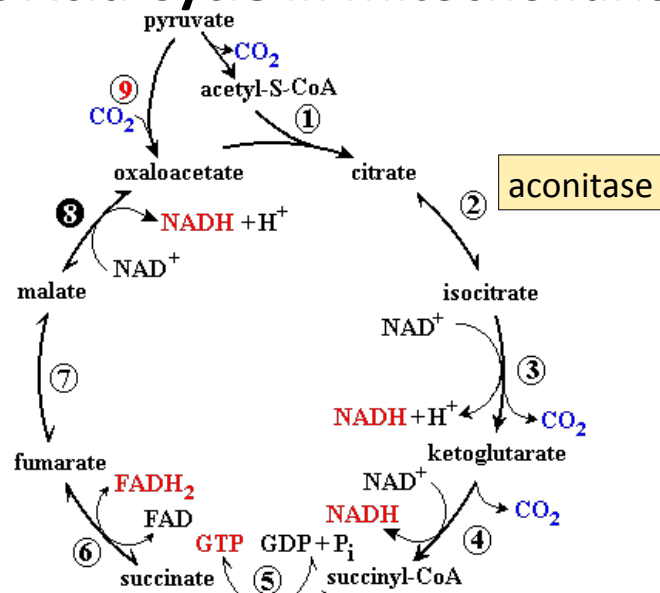


\*G Oliveira et al. Developmental Medicine & Child Neurology 47(3), 185-189, 2005.

## Detoxification of Superoxide ( $O_2^-$ )

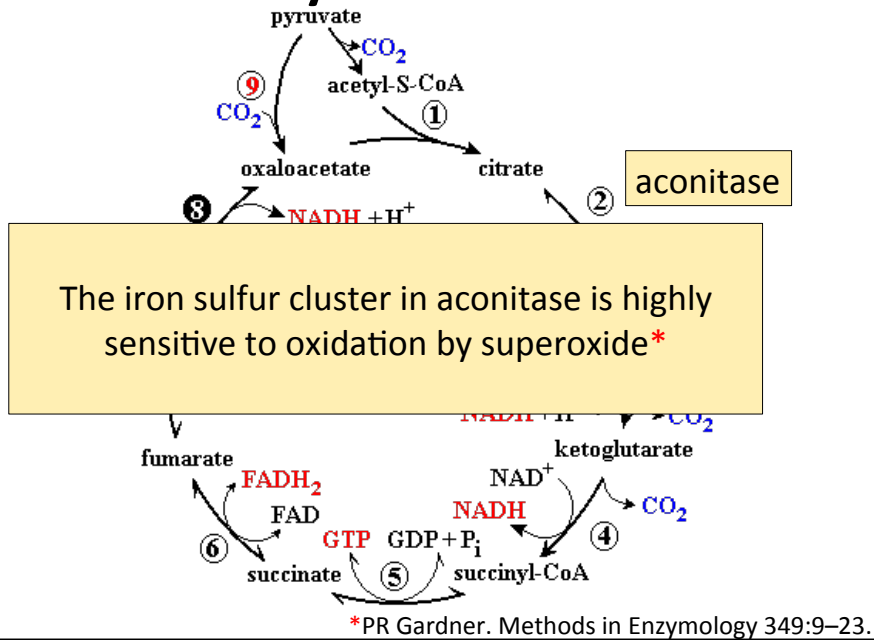


## Citric Acid Cycle in Mitochondria



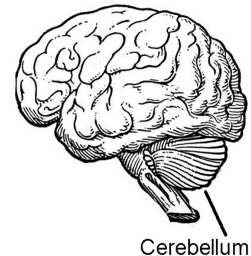
\*PR Gardner. Methods in Enzymology 349:9-23.

## Citric Acid Cycle in Mitochondria



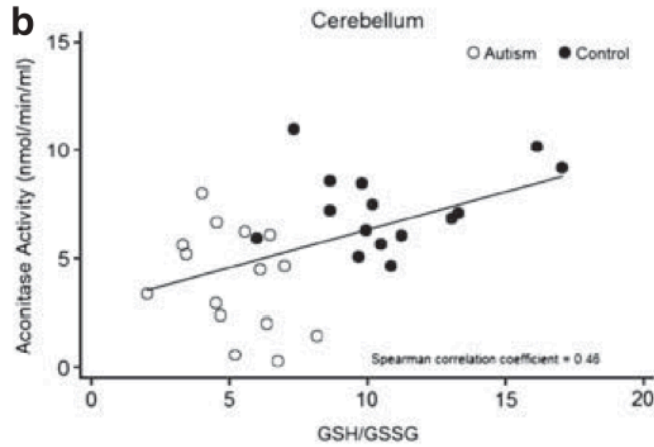
## Aconitase Dysfunction and Brain Inflammation in Autism\*

- Frozen samples of post-mortem tissues from cerebellum and temporal cortex of autism patients compared with controls.
- Compared to controls:
  - Aconitase activity was significantly reduced in the cerebellum and correlated with low glutathione levels
  - Biomarkers of inflammation were increased



\*S. Rose et al. Transl Psychiatry (2012) 2:e134.

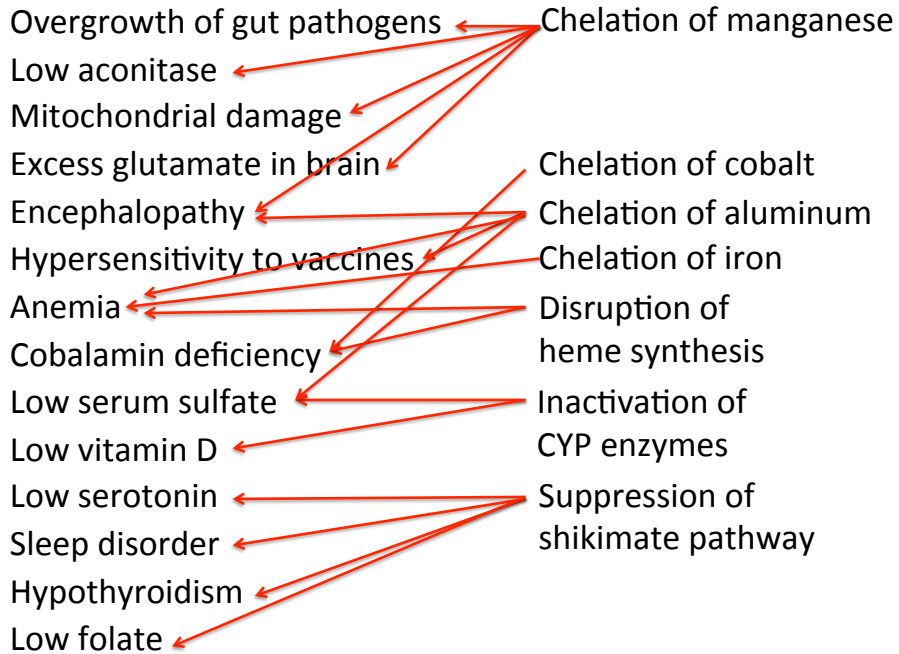
## Aconitase & Glutathione in Cerebellum in Autism\*



\* S Rose et al. Transl Psychiatry (2012) 2:e134.

### Comorbidities of Autism

### Effects of Glyphosate



## Sub-Outline

### Glyphosate and manganese deficiency

- Lactobacillus and anxiety
- Glutamate and ammonia
- Mitochondrial disorder
- Impaired bone development

## Glyphosate and Bone Development\*

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



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

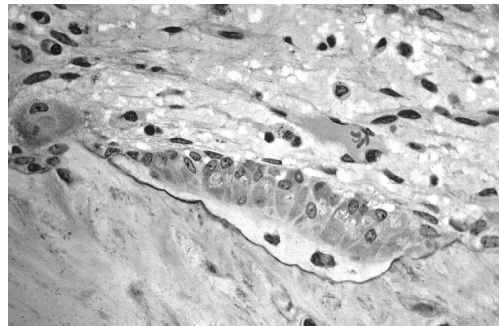
## Manganese and Bones\*

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

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

## Osteoblasts build “Ground Substance”

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

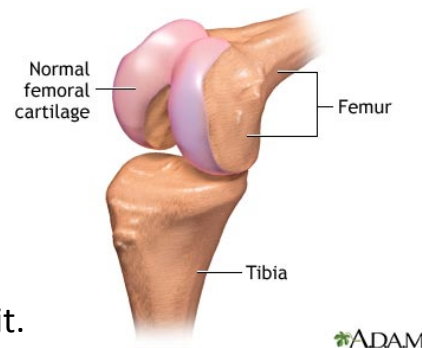


Osteoblasts in bone

Childhood osteoarthritis and osteomalacia  
are an epidemic in the US today

## Chondroitin Sulfate Synthesis in Cartilage depends on Manganese\*

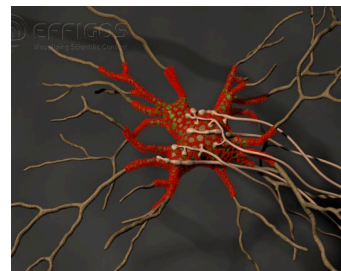
- Two critical enzymes are manganese dependent:
  - Polymerase enzyme forms the polysaccharide
  - Galactotransferase incorporates galactose that links the polysaccharide to the protein associated with it.



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

## Perineuronal Nets\*

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

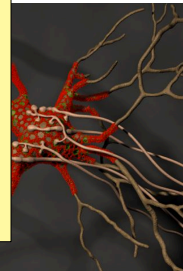


\*G. Bruckner et al. Glia 8(3), 183-200, 1993.



## Perineuronal Nets\*

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



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

## Coral Die-Off & Chondroitin Sulfate\*

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



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

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

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



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

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

## Outline

- Autism & Glyphosate
- Soy: Why It's Dangerous
- Glyphosate, Aluminum and Vaccines
- Glyphosate and breast cancer
- Bile Acid Disruption by Glyphosate
  - Arsenic toxicity → kidney failure
  - Manganese *toxicity* → Parkinson's disease
  - Manganese *deficiency* → Autism
- **Infertility and Birth Malformations**
- Summary

## Latest News in US: 2014 Statistics

- U.S. maternal deaths near all-time high
  - 18.5 per 100,000 births today compared to 7.2 in 1987
  - We now rank lower than China, as #60 on a list of 180 countries
  - Our rate is more than 3x that in Great Britain
- Teen pregnancy, birth and abortion rates have declined to historic lows over the last 30 years
  - 13% drop in teen pregnancy in the past year

## Glyphosate, Sperm and Aromatase\*

- Acute exposure (0.5%) of Roundup in fifteen 60-day-old male rats during an 8-day period
- Aromatase mRNA levels increased by at least 50% in treated rats at all times
  - Protein expression also increased
- Aromatase converts testosterone to estrogen



\*E. Cassault-Meyer et al. Environmental Toxicology and Pharmacology 38 (2014) 131–140

## Glyphosate, Sperm and Aromatase\*

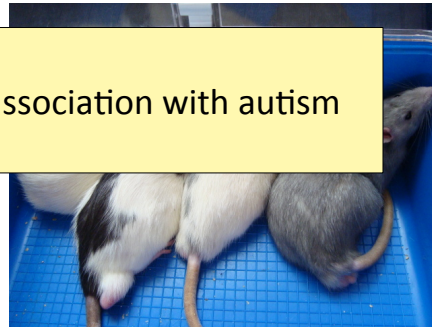
- Acute exposure (0.5%) of Roundup in fifteen 60-

Aromatase is defective in association with autism

in treated rats at all times

- Protein expression also increased

- Aromatase converts testosterone to estrogen



\*E. Cassault-Meyer et al. Environmental Toxicology and Pharmacology 38 (2014) 131–140

## Glyphosate, Sperm and Aromatase\*

- Acute exposure (0.5%) of Roundup in fifteen 60-

Aromatase is a Cytochrome P450 Enzyme

in treated rats at all times

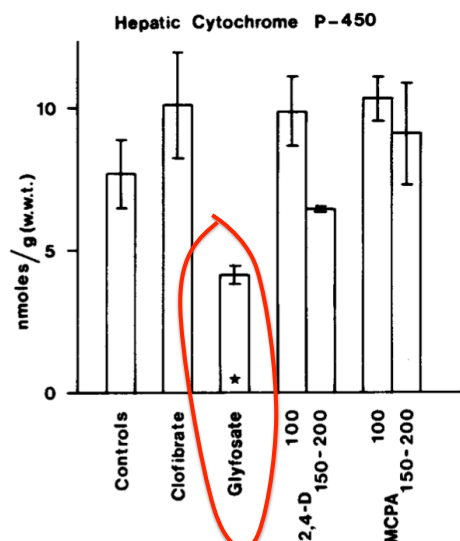
- Protein expression also increased

- Aromatase converts testosterone to estrogen



\*E. Cassault-Meyer et al. Environmental Toxicology and Pharmacology 38 (2014) 131–140

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



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

\*E Hetanen et al., Acta Pharmacol.  
Et Toxicol. 1983, 53, 103-1 12.

## "Male fertility under threat as average sperm counts drop"\*

- Study of 26,600 men in France found sperm concentration had decreased by 32% since the 1990s.
- Numbers steadily dropped by 2% per year from 1989 to 2005.
- Proportion of normally formed sperm also declined by about 1/3.



\* M. Rolland et al., Hum Reprod. 2013 Feb;28(2):462-70.

## Sperm Motility and Manganese\*

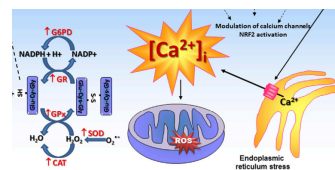
- Sperm have an unusual form of adenylate cyclase that depends upon *manganese* as a cofactor
- This enzymes produces cAMP which is necessary for flagella formation
- Flagella are what make sperm able to swim



\*T Braun and RF Dods, Proc Nat Acad Sci USA 1975;72(3):1097-1101.

## Glyphosate's Effects on Sertoli Cells in Rat Testis\*

- Concentrations 10-fold more diluted than that recommended for herbicide action
- Several pathologies noted:
  - Depletes glutathione (essential antioxidant)
  - Enhanced lipid and protein oxidation
  - Activates calcium channels; promotes calcium release from ER (stress response); induces cell death
  - Increases mitochondrial membrane permeability to calcium and protons



**Necrotic Cell Death**

\*V.L. Oliveira Cavalli et al., Free Radical Biology and Medicine 65, Dec. 2013, 335-346.

## Glyphosate and Anencephaly\*

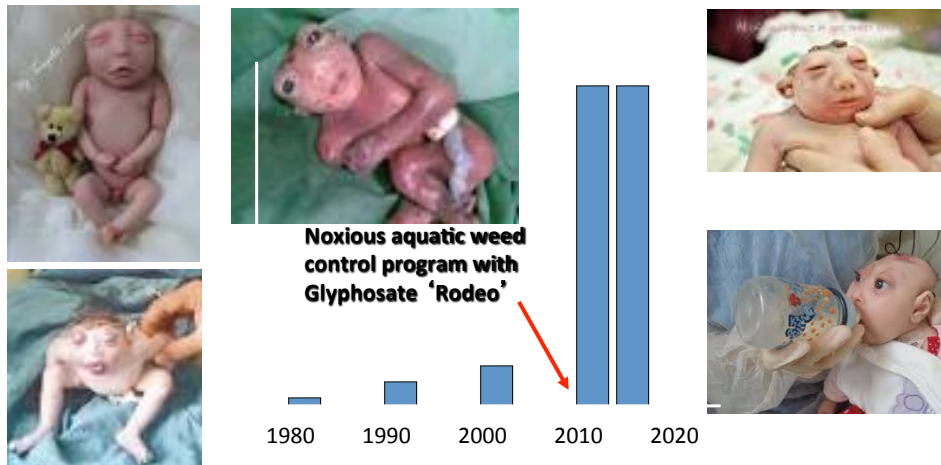
- Yakima, Benton and Franklin counties in Washington State have an unusually high number of pregnancies affected by the birth defect, anencephaly
- 75 pesticides were analyzed in studying contamination due to surrounding agriculture
  - 47 (63%) of these were detected
  - Glyphosate was applied in large amounts, but was not studied
- 5% solution of glyphosate was also used heavily around irrigation ditches to control weeds
  - Main herbicide recommended due to its “low toxicity”



***Glyphosate has been linked to anencephaly due to its effect on retinoic acid***

\*Barbara H. Peterson. Farm Wars, <http://farmwars.info/?p=11137>

## “Glyphosate, Brain Damaged Babies, and Yakima Valley - A River Runs Through It”\*



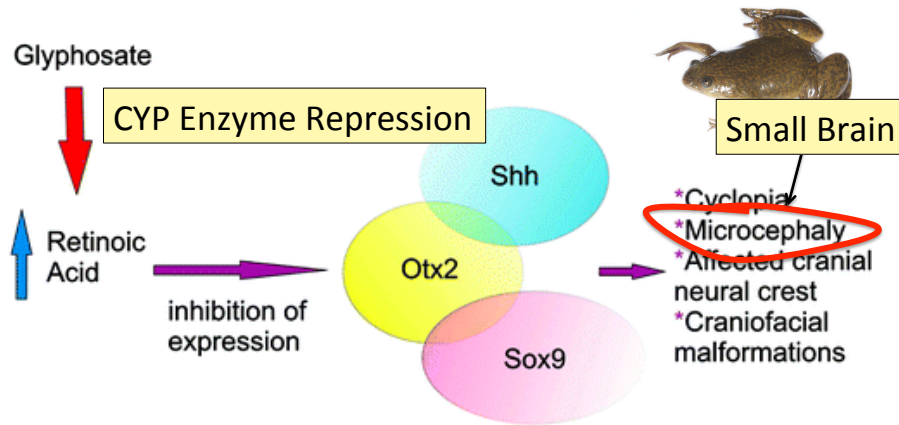
## “Glyphosate, Three Rivers, and Anencephaly”

Yakima Harold Republic

Slide thanks to Prof. Don Huber, with permission

\*Farm Wars 3/6/14

## Glyphosate Upregulates Retinoic Acid\*



\*A. Carrasco, Teratogenesis by glyphosate based herbicides and other pesticides. Relationship with the retinoic acid pathway. In Breckling, B. & Verhoeven, R. (2013) GM-Crop Cultivation – Ecological Effects on a Landscape Scale. Theorie in der Ökologie 17. Frankfurt, Peter Lang.

## What to Do!





## Eat Foods Containing Manganese





## Summary

- Glyphosate contamination in our food supply is a serious threat to health
  - Compounded by use of hexane in chemical processing
- Here, I have focused on autism, breast cancer, Parkinson's disease, infertility and birth defects
- GM "Roundup Ready" soy processed into soy protein and soybean oil using hexane is a toxic food
- A key feature of glyphosate's toxicity is disruption of bile acids, leading to manganese accumulation in the liver and deficiencies elsewhere