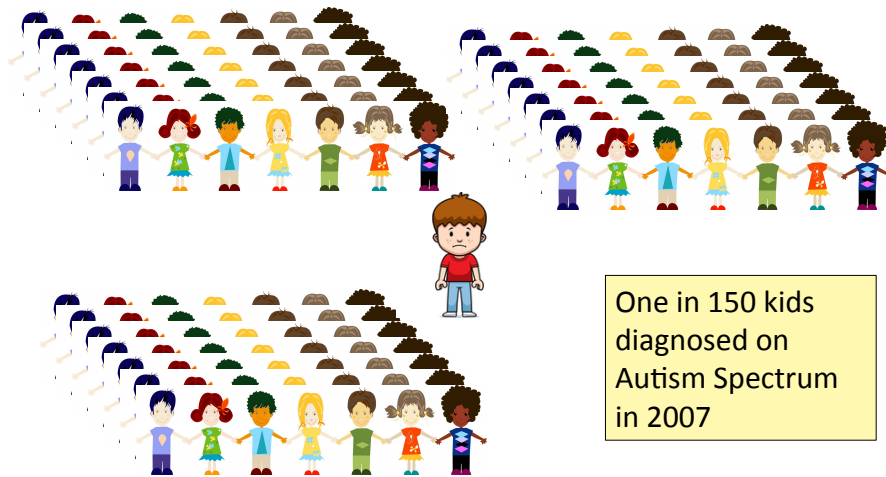
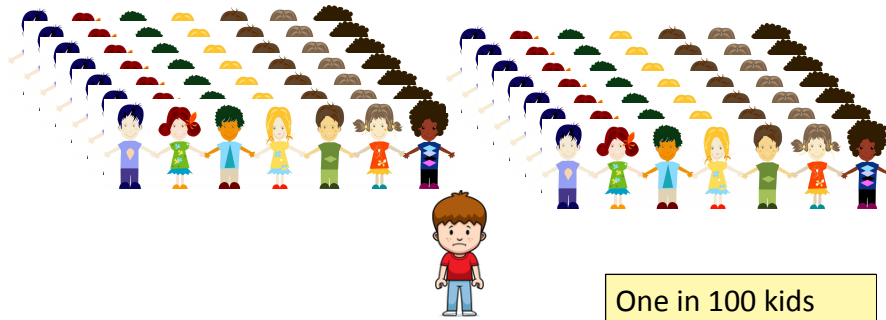




The Autism Epidemic in the U.S.



The Autism Epidemic in the U.S.



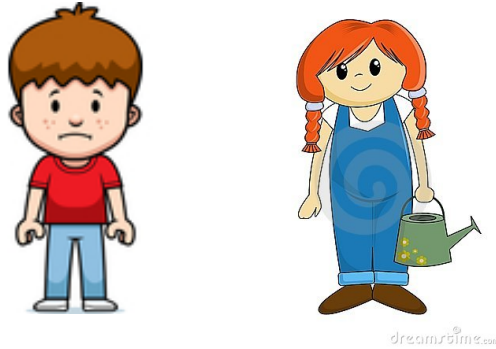
One in 100 kids
diagnosed on
Autism Spectrum
in 2009

The Autism Epidemic in the U.S.



One in 50 kids
diagnosed on
Autism Spectrum
in Mar. 2013

One in Two in 2025?

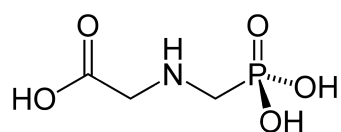


The rate was 1 in 10,000 in 1970

Some Comorbidities with Autism

- Disrupted gut bacteria
- Impaired homeostasis of sulfur metabolites (especially sulfate)

Is there a toxic substance that is currently on the rise in our environment that could account for these comorbidities?



Glyphosate




- Glyphosate is now the #1 herbicide in the U.S. and is increasingly used around the world
 - Developed and patented by Monsanto in the 1970's
 - Came out from under patent in 2000
 - Inhibits an enzyme in the shikimate pathway involved in 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 decade

Is Glyphosate Nontoxic?

- Monsanto has argued that glyphosate is harmless to humans because we don't have the shikimate pathway
- However, our gut bacteria DO have this pathway
 - We depend upon them to supply us with essential amino acids (among many other things)
 - Tryptophan → serotonin → melatonin
 - Tyrosine → dopamine, adrenaline, and melanin
- Roundup contains surfactants that greatly increase glyphosate's toxic effects
- Insidious effects of glyphosate accumulate over time

Recent Publication



ISSN 1099-4300
www.mdpi.com/journal/entropy

Review

Glyphosate's Suppression of Cytochrome P450 Enzymes and Amino Acid Biosynthesis by the Gut Microbiome: Pathways to Modern Diseases

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Abstract: Glyphosate, the active ingredient in Roundup®, is the most popular herbicide used worldwide. The industry asserts it is minimally toxic to humans, but here we argue otherwise. Residues are found in the main foods of the Western diet, comprised primarily

MIT Computer Science and Artificial
Intelligence Laboratory



研究：除草劑抗農達恐有害健康

REUTERS 路透社 - 2013年4月26日 星期五 下午12:02

(路透紐約25日電) 新研究指出，大量使用全球最熱門的除草劑抗農達 (Roundup)，可能與各種健康問題與疾病有關，像是巴金森氏症、不孕與癌症等。

根據這份同儕審查的報告，證據顯示食物中可發現「嘉磷塞」(glyphosate) 殘留。嘉磷塞是除草劑抗農達的主成分，已噴灑在數百萬英畝的作物。

研究報告上週發表在「熵」(Entropy) 科學期刊。

研究指出，嘉磷塞殘留會使環境中其他食源性化學殘留與毒素的傷害性增加，妨礙人體正常功能並誘發疾病等。

研究作者為麻省理工學院 (MIT) 研究員塞內夫 (Stephanie Seneff) 與曾任職阿瑟李特公司 (Arthur D. Little Inc) 及現已退休的科學顧問沙姆索 (Anthony Samsel)。

研究說：「嘉磷塞的負面衝擊會潛伏在人體中，並隨時間慢慢顯現。」

來自好幾國的環保人士、消費者團體與植物科學家已警告，大量使用嘉磷塞會對植物、人類與動物造成問題。

然而抗農達生產商孟山都公司 (Monsanto) 與其他主要業界專家多年來都表示，嘉磷塞的安全性已獲證實，並且對環境的破壞性衝擊要小於其他普遍使用的化學藥劑。中央社

MIT Computer Science and Artificial
Intelligence Laboratory

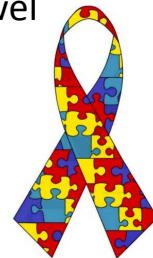
5/22/13

Glyphosate: Some Biological Effects

- Depletes aromatic amino acids and methionine
 - Serotonin deficiency is linked to obesity, autism, Alzheimer's disease, depression, and violent behavior
 - Dopamine deficiency leads to Parkinson's disease
 - Methionine is an essential sulfur-containing amino acid
- Disrupts gut bacteria
 - Studies with chickens and cows show overgrowth of pathogens in gut
- Disrupts cytochrome P450 (CYP) enzymes which are involved in:
 - Homeostasis of sterols like vitamin D, cholesterol, and sex hormones
 - Bile acid production
 - Detoxifying environmental toxins
 - Stabilizing blood (hemorrhaging vs blood clots)
- Depletes important minerals
 - Calcium, manganese, zinc, cobalt, iron,
- Likely impairs sulfate synthesis and sulfate transport

Some Biomarkers for Autism

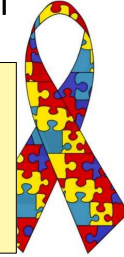
- Disrupted gut bacteria; inflammatory bowel
- Low serum sulfate
- Methionine deficiency
- Serotonin and melatonin deficiency
- Defective aromatase (CYP enzyme)
- Zinc and iron deficiency
- High serum nitrate and ammonia
- Impaired immune function
- Chronic low-grade inflammation in the brain



Some Biomarkers for Autism

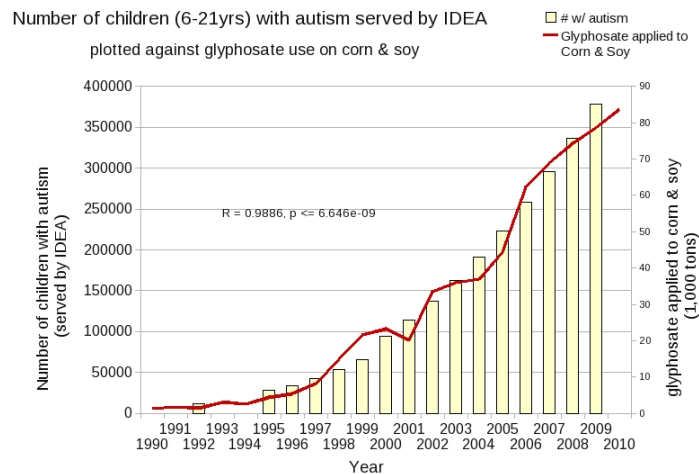
- Disrupted gut bacteria; inflammatory bowel
- Low serum sulfate

These can all be explained as potential effects of glyphosate on biological systems



- High serum nitrate and ammonia
- Impaired immune function
- Chronic low-grade inflammation in the brain

Glyphosate and Autism*

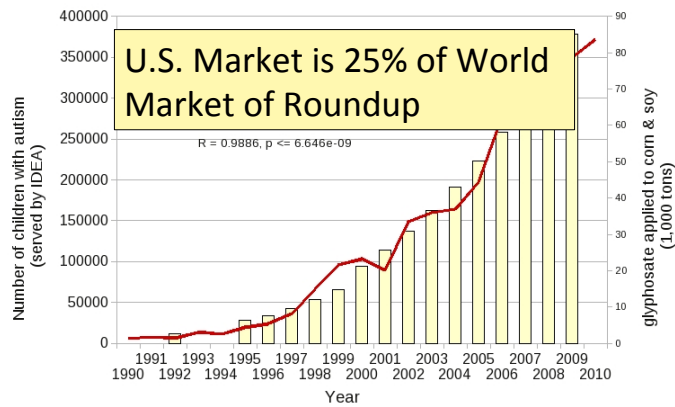


Pearson Correlation Coefficient = 0.985

*Nancy Swanson, <http://www.examiner.com/article/data-show-correlations-between-increase-neurological-diseases-and-gmos>

Glyphosate and Autism*

Number of children (6-21yrs) with autism served by IDEA plotted against glyphosate use on corn & soy



Pearson Correlation Coefficient = 0.985

*Nancy Swanson, <http://www.examiner.com/article/data-show-correlations-between-increase-neurological-diseases-and-gmos>

Sulfate

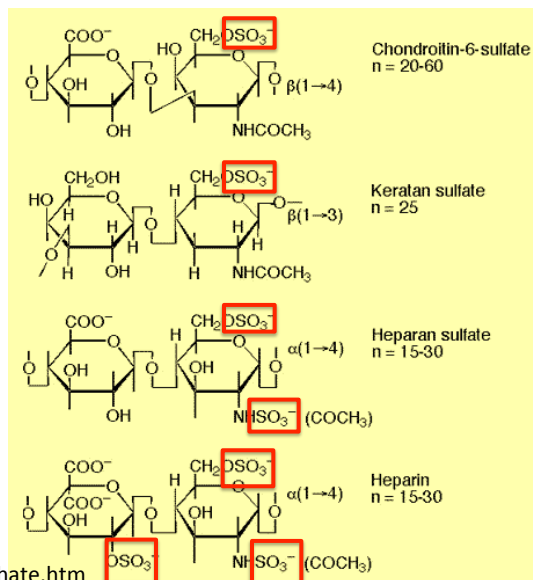
Rosemary Waring on Autism (1990)*

“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.

Sulfated Glycosaminoglycans (GAGs)

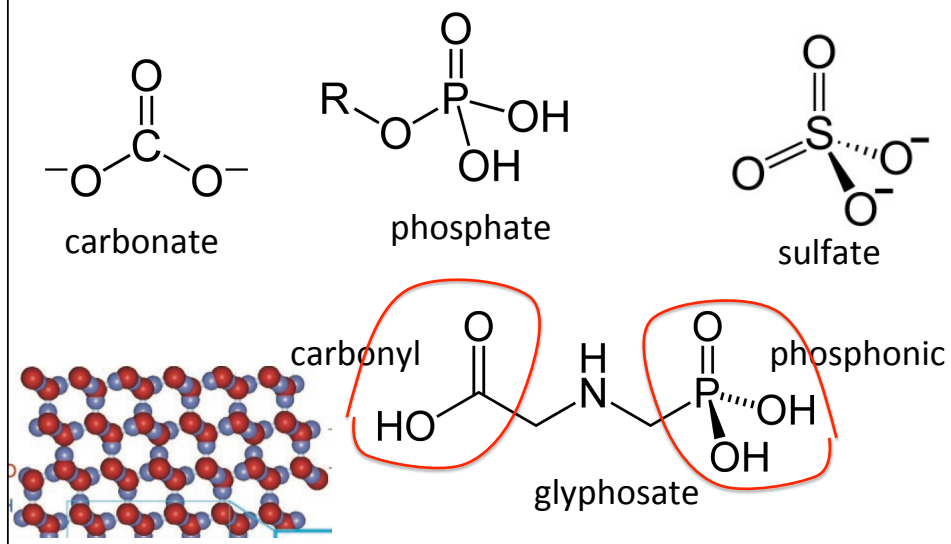
- Prominent in extracellular matrix of nearly all cells
- Amount of sulfate depends on availability
- Involved with ion and nutrient transport across plasma membrane
- Crucial for maintaining healthy blood vessels



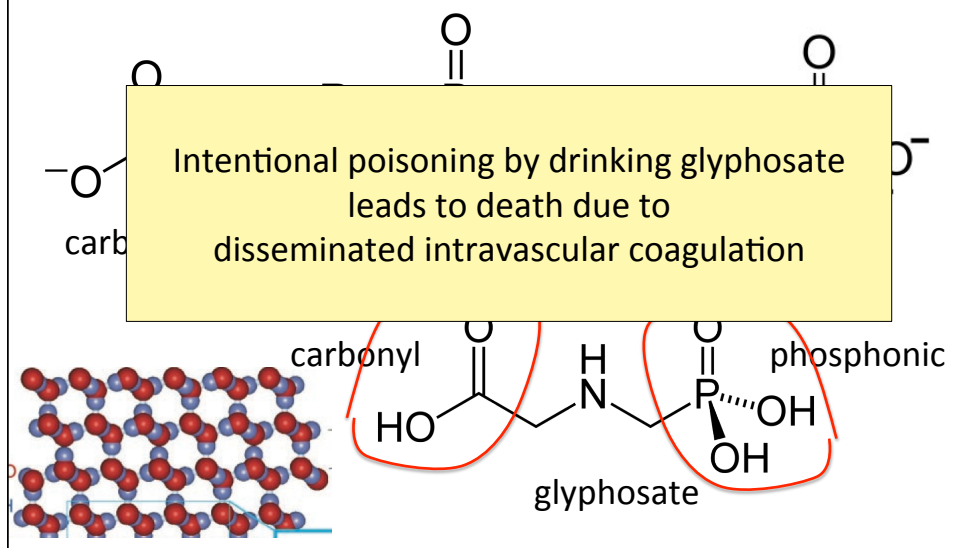
Impaired heparan sulfation in mouse brains led to all the symptoms of autism*

* Irie, F.; Badie-Mahdavi, H.; Yamaguchi, Y. Autism-like socio-communicative deficits and stereotypies in mice lacking heparan sulfate. Proc. Natl. Acad. Sci. USA 2012, 109, 5052–5056.

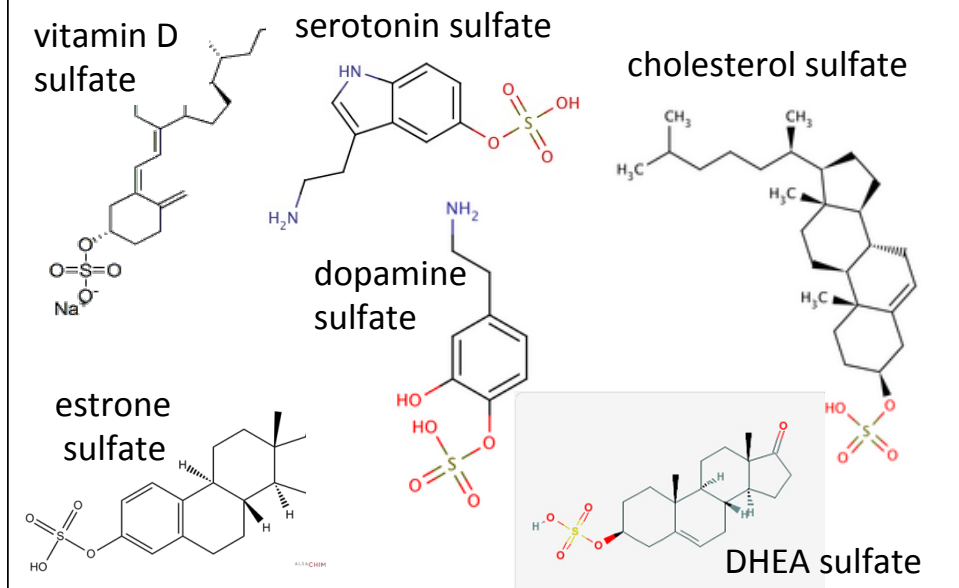
Kosmotropes Gel the Blood



Kosmotropes Gel the Blood



Safe Sulfate Transport: Carbon Rings

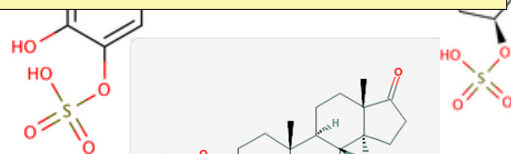
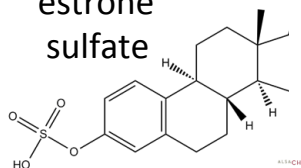


Safe Sulfate Transport: Carbon Rings

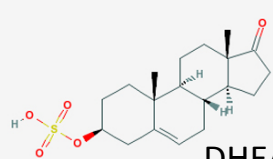
vitamin D sulfate serotonin sulfate cholesterol sulfate

Glyphosate depletes serotonin and dopamine and disrupts enzymes involved with sterol sulfation: Imperiled sulfate transport

estrone sulfate



DHEA sulfate

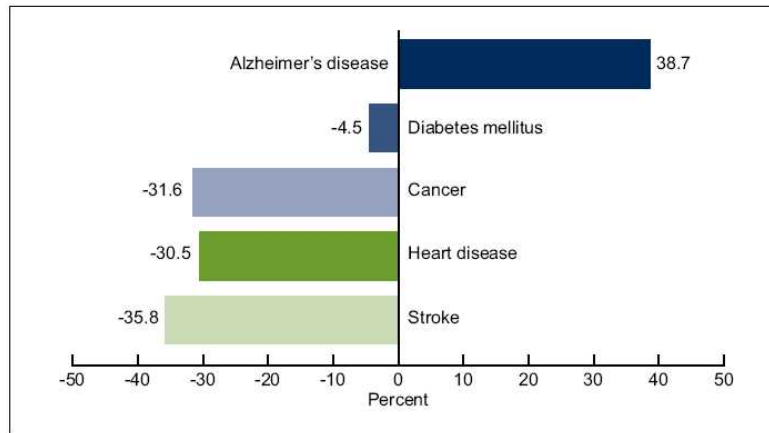


Alzheimer's Disease,
Infant Mortality,
and Obesity

Changes in Causes of Death in U.S.

Alzheimer's disease mortality increased compared with selected major causes of death.

Figure 1. Percent change in age-adjusted death rates for selected causes of death: United States, 2000 and 2010

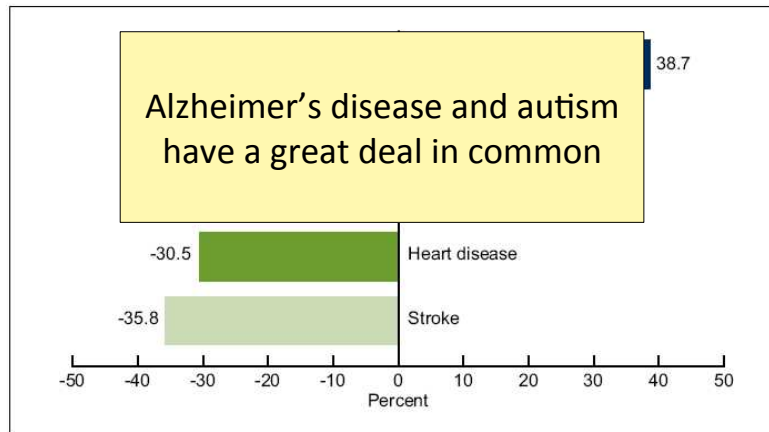


SOURCE: National Vital Statistics System, Mortality.

Changes in Causes of Death in U.S.

Alzheimer's disease mortality increased compared with selected major causes of death.

Figure 1. Percent change in age-adjusted death rates for selected causes of death: United States, 2000 and 2010



SOURCE: National Vital Statistics System, Mortality.

Infant Mortality Rates: U.S. and Elsewhere

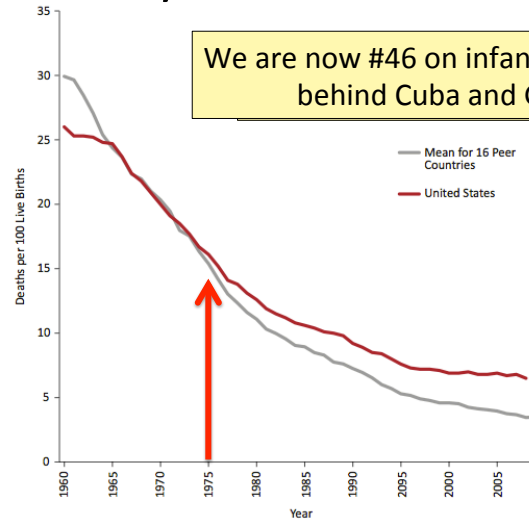
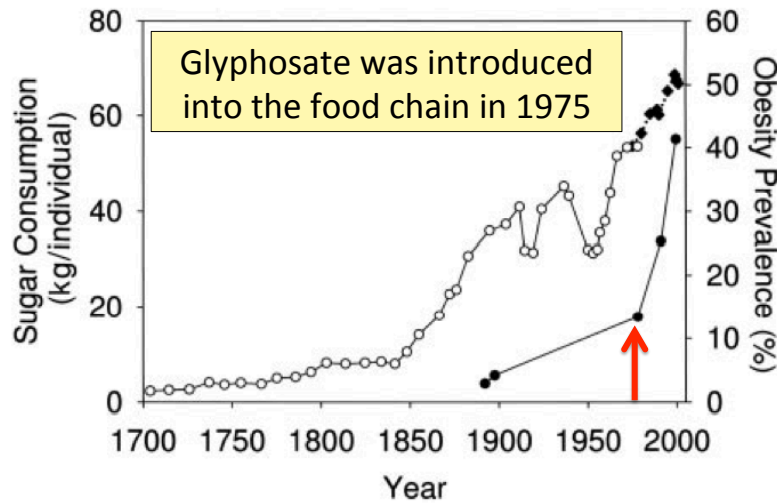


FIGURE 2-4 Infant mortality rates in the United States and average of 16 peer countries, 1960-2009.
 NOTES: The average is calculated for the 16 peer countries examined in Chapter 1.
 SOURCE: Viner (2012, supplemental analysis).

Obesity in US over Time*



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

To my knowledge, no studies
have been done assessing the
effects of glyphosate on humans

The U.S. government does
minimal monitoring of
glyphosate residues in foods

Summary

- I believe we need to be very worried about glyphosate in the food and water supplies
- Glyphosate's disruption of gut bacteria, depletion of essential amino acids and minerals, and interference with cytochrome P450 enzymes have widespread consequences
- Glyphosate may be the most important factor in the U.S. health crisis related to obesity, autism, Alzheimer's disease and infant mortality

Thank you!