



Glyphosate Pretending to be Glycine: Devastating Consequences

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Outline

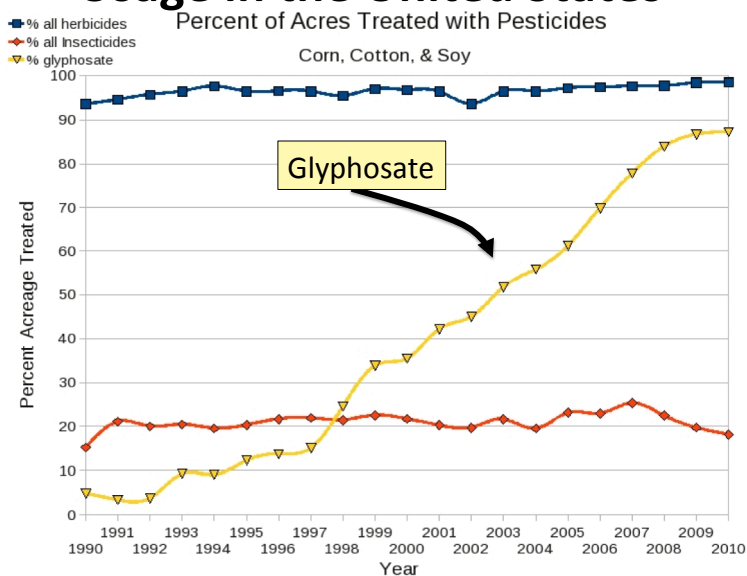
- Introduction
- Glyphosate as a glycine analogue
- Autoimmune disease
- Collagen and gelatin
- How to protect yourself
- Summary

Roundup and GMO Crops

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

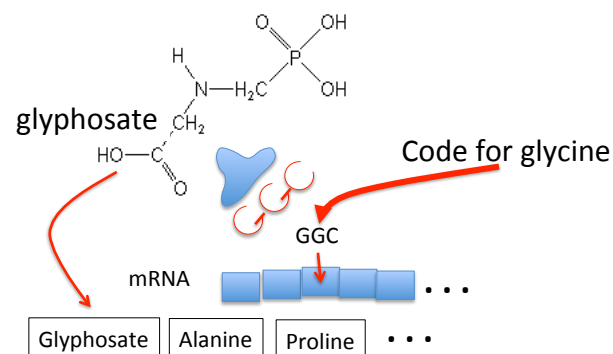


Glyphosate vs. Other Pesticides: Usage in the United States*



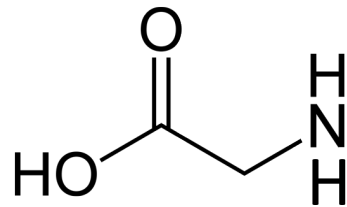
Glyphosate as a Glycine Analogue

What If Glyphosate Could Insert Itself Into Protein Synthesis by mistake???



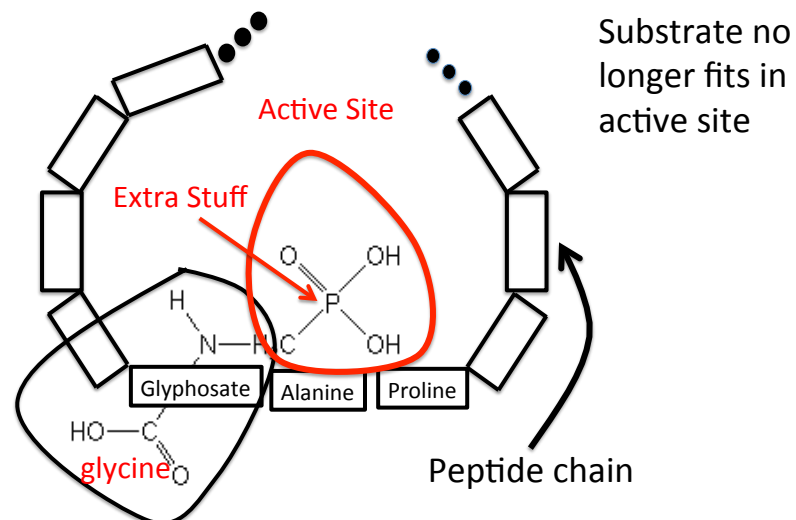
Any proteins with conserved glycine residues are likely to be affected in a major way

Glyphosate is a non-coding amino acid analogue of glycine



Glycine

Extra Piece Sticks Out at Active Site



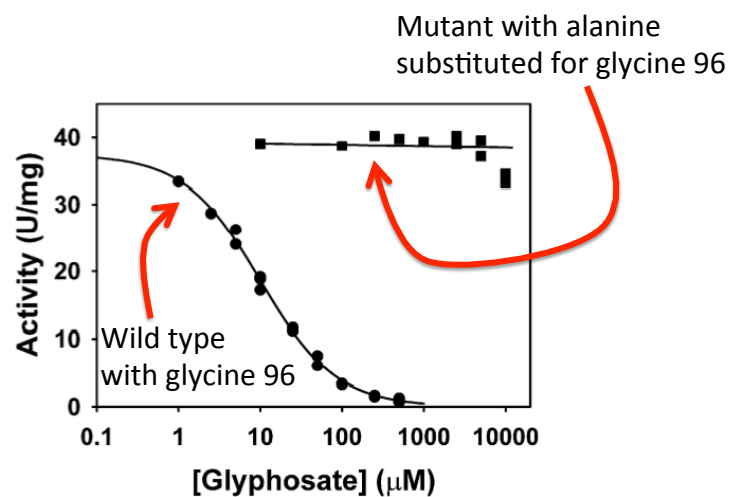
Extra Piece Sticks Out at Active Site

This explains how glyphosate disrupts EPSPs in the shikimate pathway:
Multiple bacteria have developed resistance by replacing active site glycine with alanine and this is the basis for GMO Roundup Ready crops*

Substrate no
fits in
site

*T Funke et al., Molecular basis for the herbicide resistance of Roundup Ready crops. PNAS 2006;103(35):13010-13015.

Inhibition of EPSPs by glyphosate: Resistant E coli mutant*



*Figure 3, S Eschenburg et al. Planta 2002;216:129-135.

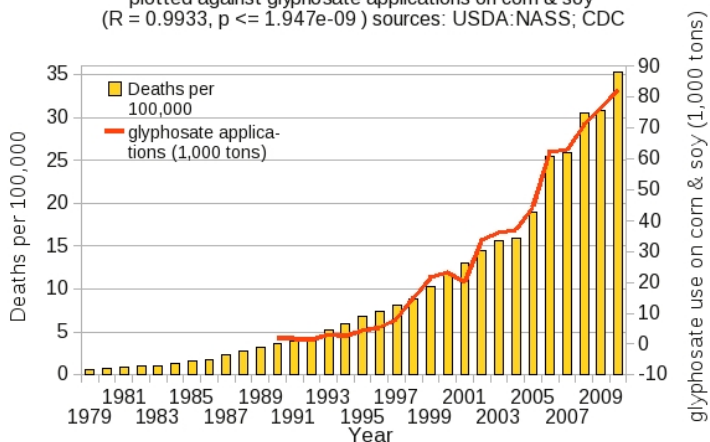
Some Predicted Consequences*

- Neurological diseases
- Autoimmune diseases
- Chronic fatigue syndrome
- Impaired collagen → osteoarthritis
- Fatty liver disease
- Obesity and adrenal insufficiency
- Impaired iron homeostasis and kidney failure
- Insulin resistance and diabetes
- Cancer

*Samsel A and Seneff S. Journal of Biological Physics and Chemistry 2016;16:9-46.

Dementia and Glyphosate*

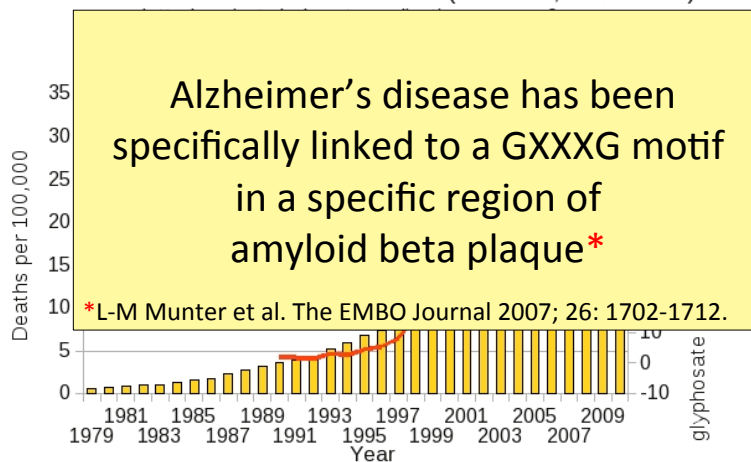
Deaths from Senile Dementia (ICD F01, F03 & 290)
plotted against glyphosate applications on corn & soy
($R = 0.9933$, $p < 1.947e-09$) sources: USDA:NASS; CDC



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

Dementia and Glyphosate*

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Autoimmune Disease

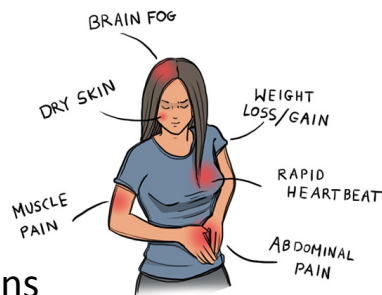
Autoimmune Disease: An Invisible Epidemic*

“Taken together, the number of people suffering from autoimmune diseases is 24–50 million Americans, 16% of the US population. To put it in perspective, autoimmune disease prevalence equals heart disease and cancer combined.”

*Feldman B, Martin EM, Simms T. An Invisible Epidemic — When your body attacks itself — Autoimmune Disease; How Reframing the Data Unveils a Public Health Crisis Bigger than Cancer and Heart Disease Combined. www.tincture.io.

Autoimmune Disease Statistics*

- Annual direct health care costs for AD in US estimated to be ~\$100 billion
- At least 23.5 million Americans suffer from one or more autoimmune diseases
- Among the top-10 causes of death in females under 64 years old
- Immunosuppressant treatments have devastating side effects



*<https://www.aarda.org/autoimmune-information/autoimmune-statistics/>

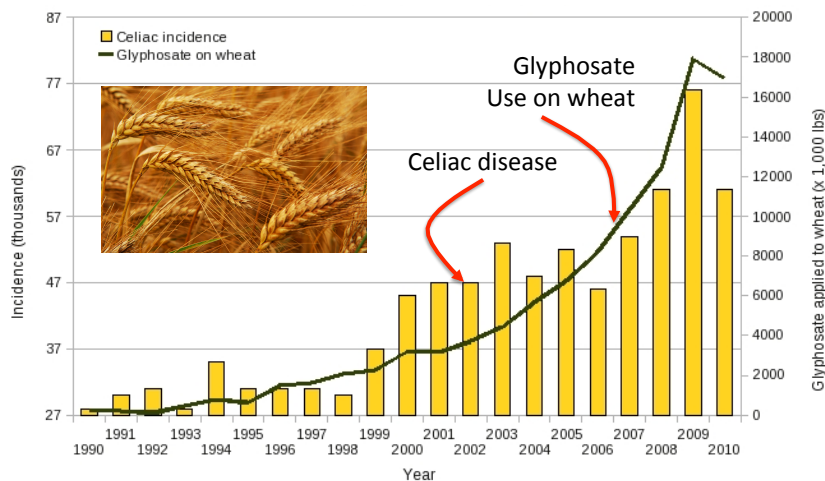
Why do we have an epidemic in autoimmune disease in America today?

Hypothesis

- Glyphosate exposure sets up a weakened immune system, a leaky gut barrier and a leaky brain barrier
- Glyphosate contamination in proteins makes them hard to break down
- Glyphosate disrupts the pancreatic enzymes that metabolize proteins
- Person develops overactive antibody response to foreign protein contaminated with glyphosate and, through molecular mimicry, this leads to autoimmune disease
- This easily explains gluten intolerance and other food allergies



Glyphosate and Celiac Disease*



*Samsel and Seneff, Interdiscip Toxicol. 2013;6(4): 159–184.

Celiac disease: Impaired gluten digestion

- Gluten intolerance results from inability to break down gluten, which is enriched in proline*
- The enzyme that breaks down proline depends on *manganese* as a catalyst (depleted by glyphosate)
- It also contains three regions with highly conserved glycines**
- Malabsorption can lead to nutritional deficiencies and symptoms of autism***

*G. Janssen et al., PLoS One 2015; 10(6): e0128065

**F Morel et al., Biochimica et Biophysica Acta 1999;1429: 501-505

***SJ Genuis and TP Bouchard, J Child Neurol. 2010;25(1):114-9

Celiac disease: Impaired gluten digestion

- Gluten intolerance results from inability to break

Wheat is routinely sprayed right before harvest with glyphosate as a desiccant

Other treated plants include
Sugar cane, barley, peanuts, maize and legumes

deficiencies and symptoms of autism

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Drugs and Autoimmune Disease*

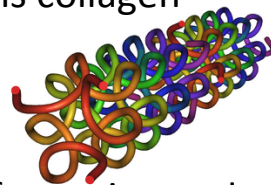
- Drugs that treat autoimmune disease have a huge problem with side effects
 - They suppress the immune system, and increase risk to tuberculosis, invasive fungal infections and lymphomas (cancers of the immune system)
- Humira is a TNF-alpha inhibitor, which blocks the immune response
 - It costs about \$3,100 per month
 - U.S. prescriptions for Humira have taken off in recent years: 1.5 million in 2011; 2.4 million in 2015.
 - It was linked to more than 209,000 adverse event reports since 2013, including more than 4,200 deaths.

* usatoday.com/story/news/nation-now/2017/03/19/analysis-reports-drug-side-effects-increase-fivefold-12-years/99384190/

Collagen and Gelatin

Collagen and Gelatin

- 25% of the protein in our body is collagen
- 25% of the amino acids in collagen are glycines
- Glyphosate substitution for glycine will disrupt triple-helix formation and lead to diseases of the vasculature, joints and bones
- Gelatin is derived from collagen in bones and ligaments sourced from cows and pigs fed glyphosate-contaminated GMO Roundup-Ready feed



Products Containing Gelatin !!



Rheumatoid Arthritis

- Inflammation in the joints causes pain and limits movement
 - Small joints of the hands, feet and cervical spine most affected
- Can lead to lung fibrosis
- Increases risk to atherosclerosis, heart attack and stroke.
- Poor iron absorption leads to "anemia of chronic disease"
- Fatigue, low grade fever, malaise, morning stiffness, loss of appetite and loss of weight



US Department of Health and Human Services Data on Pain-Killer Drug Abuse*

- Drug overdose is the leading cause of injury death in the United States
 - Heroin, morphine, and prescription pain relievers
- More people died from drug overdoses in 2014 than in any previous year on record
- More than 6 out of 10 involved an opioid drug
- More than 650,000 opioid prescriptions are dispensed every day



*<http://www.hhs.gov/opioids/about-the-epidemic/>

How to Protect Yourself



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



Summary

- Glyphosate is pervasive in our food supply today
- Recent research shows that glyphosate can have devastating consequences to health through substitution for glycine during protein synthesis by mistake
 - Bacterial gene mutations introduced in Roundup-Ready crops swap out glycine for alanine
 - Explains its correlation with multiple diseases, particularly autoimmune diseases
 - Effects are insidious and cumulative
- Probiotics and an organic diet can help protect from glyphosate damage