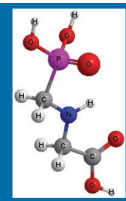




Glyphosate in MMR: Does This Explain the Autism Link?

Stephanie Seneff
CSAIL, MIT
Tuesday, Sept. 19, 2017

GLYPHOSATE



“It is dangerous to be right in matters on which the established authorities are wrong.”

– Voltaire



Outline

- What is glyphosate?
- How glyphosate affects the gut barrier
- Glyphosate in vaccines
 - Glutamate and glyphosate synergy in MMR
- Autoimmune disease through molecular mimicry
- Summary

What is Glyphosate?

Roundup and GMO Crops

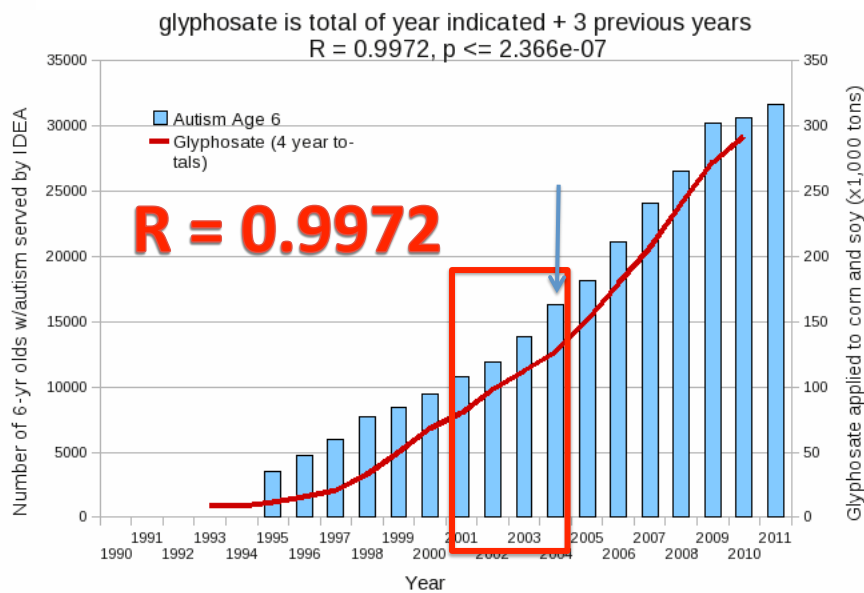
GMO Roundup-Ready corn, soy, canola, sugar beets
cotton, tobacco and alfalfa



Roundup as a Desiccant/Ripener just before Harvest



Autism Prevalence: 6 year olds*



* Figure 15, Seneff et al., Agricultural Sciences, 2015, 6, 42-70

Is Glyphosate Nontoxic?

- Monsanto has argued that glyphosate is harmless to humans because we don't have the shikimate pathway which it disrupts in plants
- However, our gut bacteria DO have this pathway
 - They use it to supply us with essential aromatic amino acids (precursors to neurotransmitters, thyroid hormone and B vitamins)
- Other ingredients in Roundup greatly increase glyphosate's toxic effects
- Insidious effects of glyphosate accumulate over time
 - Most studies are too short to detect damage

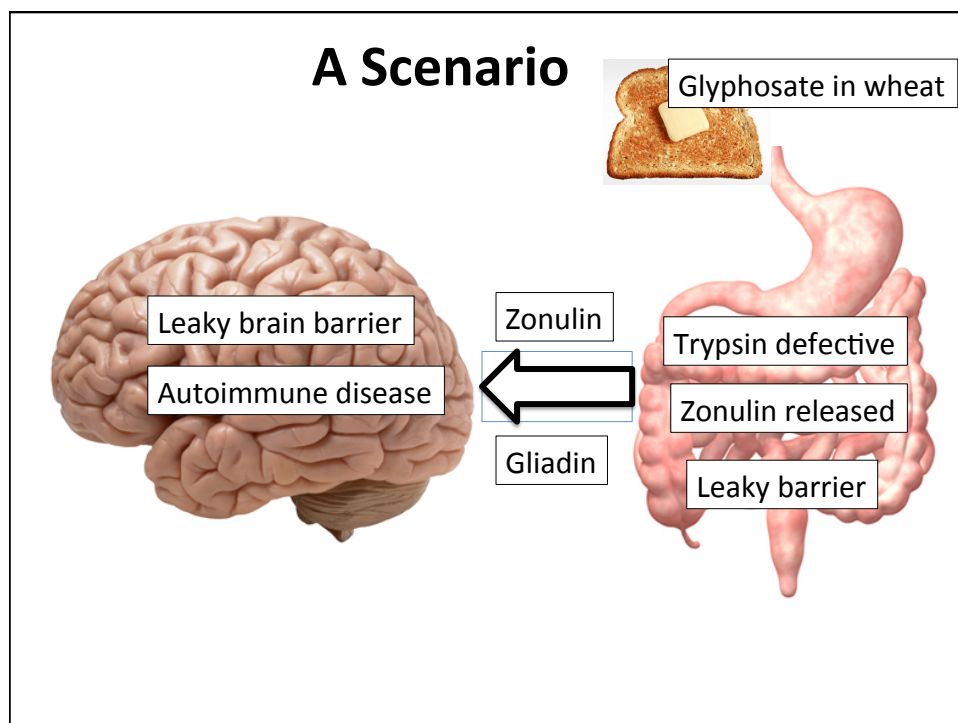
How Glyphosate Affects the Gut Barrier

Glyphosate and the Gut

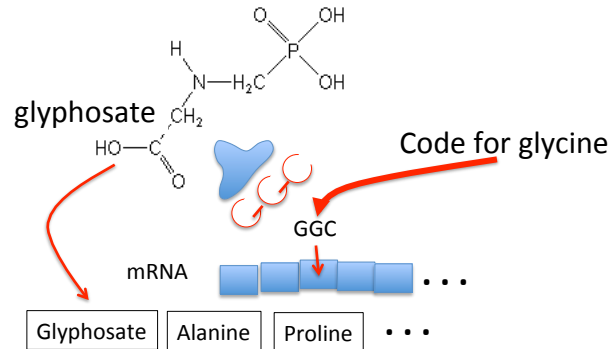
- Glyphosate has been found as a contaminant in digestive enzymes trypsin, pepsin and lipase*
- Trypsin impairment prevents proteins like gluten in wheat from being digested
- Undigested proteins induce release of zonulin which opens up gut barrier**
- Zonulin lingers because trypsin is defective

*A Samsel and S Seneff. J Biol Phys Chem 2017;17:8-32

** JJ Gildea et al. J Clin Nutr Diet. 2017, 3:1.

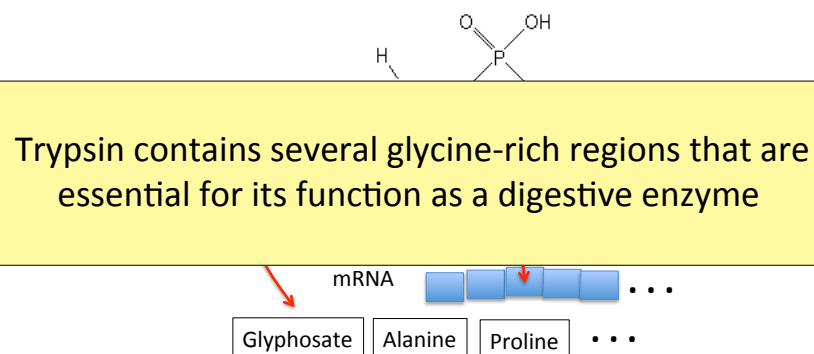


What if glyphosate could insert itself into protein synthesis by mistake???



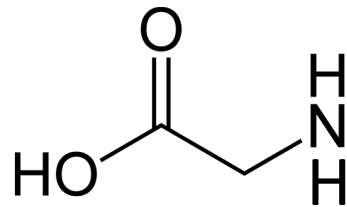
Any proteins with conserved glycine residues are likely to be affected in a major way

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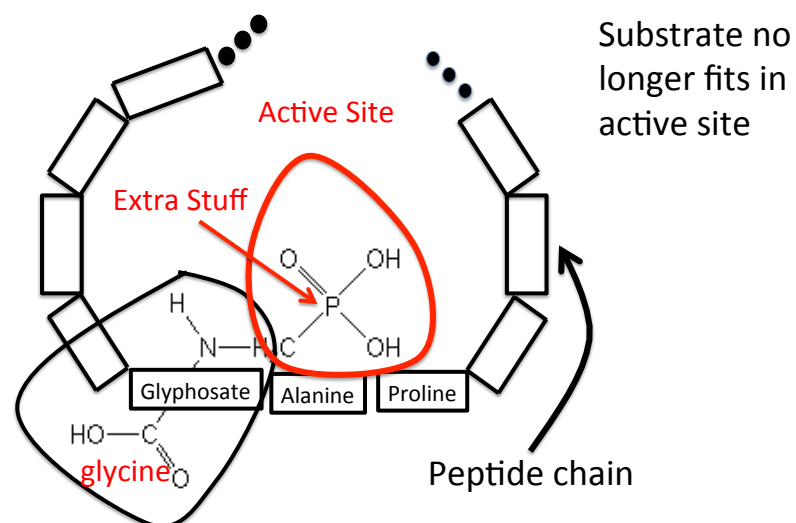
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Glyphosate is a non-coding amino acid analogue of glycine



Glycine

Extra Piece Sticks Out at Active Site



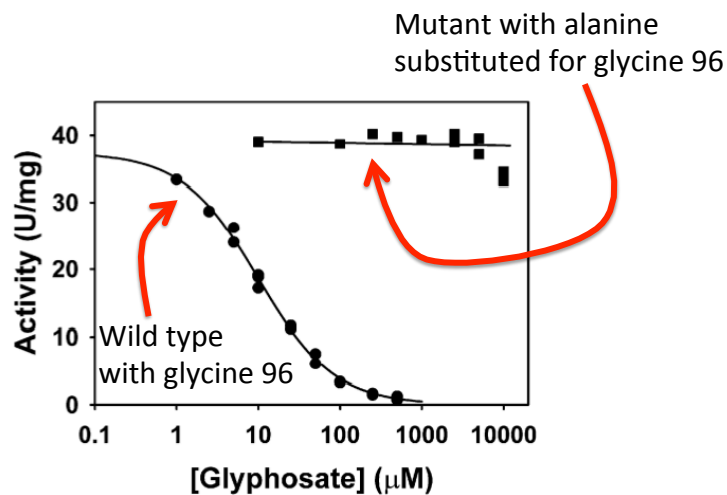
Extra Piece Sticks Out at Active Site

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*



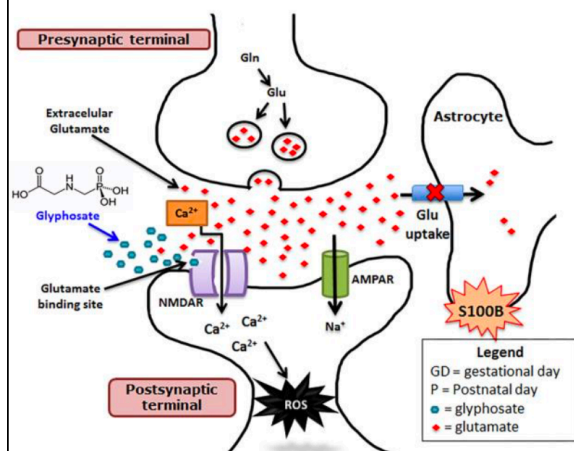
*Figure 3, S Eschenburg et al. Planta 2002;216:129-135.

Glyphosate in Vaccines

Glyphosate in Vaccines?

- For MMR, flu vaccine, and rabies vaccine, live virus is grown on *gelatin* derived from ligaments of pigs and *fetal bovine serum*
 - Cows and pigs are fed GMO Roundup-Ready corn and soy feed
- Gelatin is derived from collagen which is highly enriched in *glycine* and also contains *glutamate*
 - These two neurotransmitters excite the NMDA receptors in the brain
- Glyphosate stimulation of NMDA receptors could cause neuronal burnout

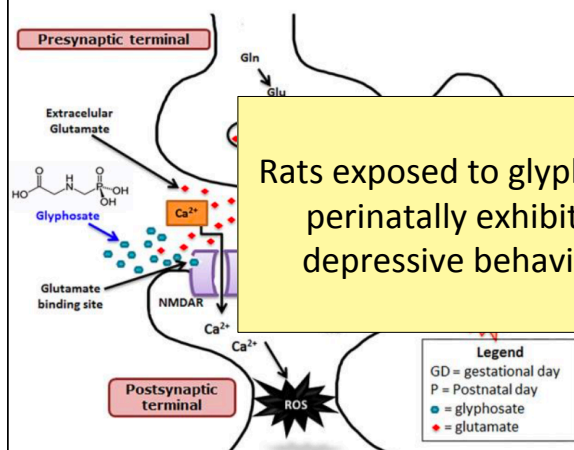
Glyphosate Excites NMDA Receptors in Hippocampus^{*,**}



*D Cattani et al. Toxicology 2014; 320:34-45.

**D Cattani et al. Toxicology 2017 [Epub ahead of print]

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Glyphosate Excites NMDA Receptors in Hippocampus*,**

Excess glutamate in

Glutamate is elevated in the blood in association with autism, and blood glutamate levels correlate with brain glutamate levels.*

Presynaptic terminal

Extracellular Glutamate

Glutamate binding site

NMDAR

AMPA

Ca²⁺

Na⁺

ROS

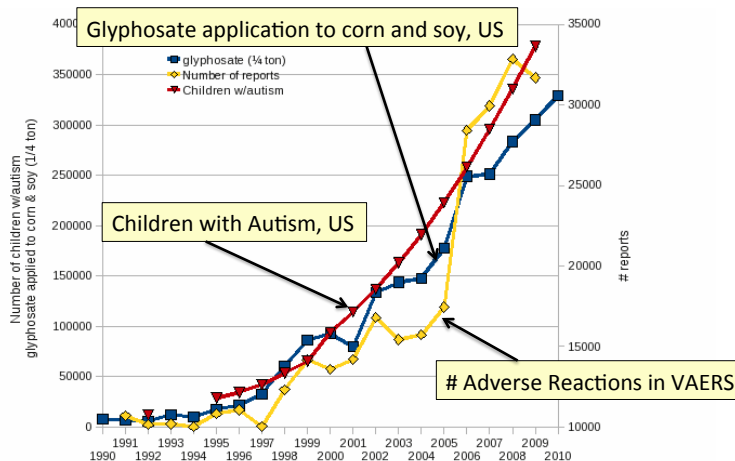
Postsynaptic terminal

S100B

Legend
GD = gestational day
P = Postnatal day
■ = glyphosate
◆ = glutamate

*Z Zheng et al. PLOS ONE 2016; 11(7): e0158688.

Autism, Glyphosate, Vaccine Reactions*



*Data readily available from the CDC, FDA (VAERS) and USDA



25SA16A

Glyphosate pathways to modern diseases VI: Prions, amyloidoses and autoimmune neurological diseases

Anthony Samsel¹ and Stephanie Seneff^{2,*}

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² Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA 02139, USA

Usage of the herbicide glyphosate on core crops in the USA has increased exponentially over the past two decades, in step with the exponential increase in autoimmune diseases including autism, multiple sclerosis, inflammatory bowel disease, type 1 diabetes, coeliac disease, neuromyelitis optica and many others. In this paper we explain how glyphosate, acting as a non-coding amino acid analogue of glycine, could erroneously be integrated with or incorporated into protein synthesis in place of glycine, producing a defective product that resists proteolysis. Whether produced by a microbe or present in a food source, such a peptide could lead to autoimmune disease through molecular mimicry. We discuss similarities in other naturally produced disease-causing amino acid analogues, such as the herbicide glufosinate and the insecticide L-canavanine, and provide multiple examples of glycine-containing short peptides linked to autoimmune disease, particularly with respect to multiple sclerosis. Most disturbing is the presence of glyphosate in many popular vaccines including the measles, mumps and rubella (MMR) vaccine, which we have verified here for the first time.

*A Samsel and S Seneff, Journal of Biological Physics and Chemistry 2017;17:8-32.



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Glyphosate pathways to modern diseases VI: Prions, amyloidoses and autoimmune neurological diseases

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Glyphosate Contamination in Vaccines (Parts Per Billion)*

Merck	ZOSTAVAX	0.62	Shingles
Merck	MMR-II	3.74	Measles, Mumps and Rubella
Merck	VARIVAX	0.56	Varicella, Chicken Pox
MERCK	PNEUMOVAX	ND	Pneumococcal 18
MERCK	PROQUAD	0.66	Measles, Mumps, Rubella, Varicella
GSK	ENERGIX-B	0.34	Heptatitis B

*A Samsel and S Seneff, Journal of Biological Physics and Chemistry 2017;17:8-32.

Symptoms of Adverse Reactions to MMR before and after 2002*

More Common Before 2002

Reaction	Count Before 2002	Count After 2002	p-value
joint pain	126	65	0.036

More Common After 2002

Reaction	Count Before 2002	Count After 2002	p-value
hospitalization	71	319	0.00037
seizures	203	462	0.0014
shortness of breath	100	216	0.010
hives	324	504	0.011
mumps	5	51	0.014
abscess	51	120	0.022
autism	69	143	0.024
eczema	4	36	0.026
ear infection	16	56	0.031
anaphylactic shock	16	54	0.034
facial swelling	45	95	0.040
swelling	860	1018	0.048

Data analyzed from the VAERS database

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Facial swelling	45	95	0.040
swelling	860	1018	0.048

These are all characteristic symptoms of allergies to MSG

*Data analyzed from the VAERS database

Autoimmune Disease through Molecular Mimicry

Arumugham, J Develop Drugs 2015, 4:4
http://dx.doi.org/10.4172/2329-6631.1000137

 **Journal of Developing Drugs**

Case Report **Open Access**

Evidence that Food Proteins in Vaccines Cause the Development of Food Allergies and Its Implications for Vaccine Policy

Vinu Arumugham*
San Jose, CA, USA

Abstract

Nobel Laureate Charles Richet demonstrated over a hundred years ago that injecting a protein into animals or humans causes immune system sensitization to that protein. Subsequent exposure to the protein can result in allergic reactions or anaphylaxis. This fact has since been demonstrated over and over again in humans and animal models.

↓

“Nobel Laureate Charles Richet demonstrated over a hundred years ago that injecting a protein into animals or humans causes immune system sensitization to that protein. Subsequent exposure to the protein can result in allergic reactions or anaphylaxis. This fact has since been demonstrated over and over again in humans and animal models.”

Large Proteins in Vaccines: Allergenic*

“Vaccines clog our lymphatic system and lymph nodes with *large protein molecules* which have not been adequately broken down by our digestive processes, since *vaccines bypass digestion* with injections. This is why vaccines are linked to *allergies*, because they contain large proteins which as circulating immune complexes (CICs) or 'klinkers' cause our body to become allergic.”

*Dave Mihalovic, ND, http://whale.to/v/vaccines_cause_allergies.html

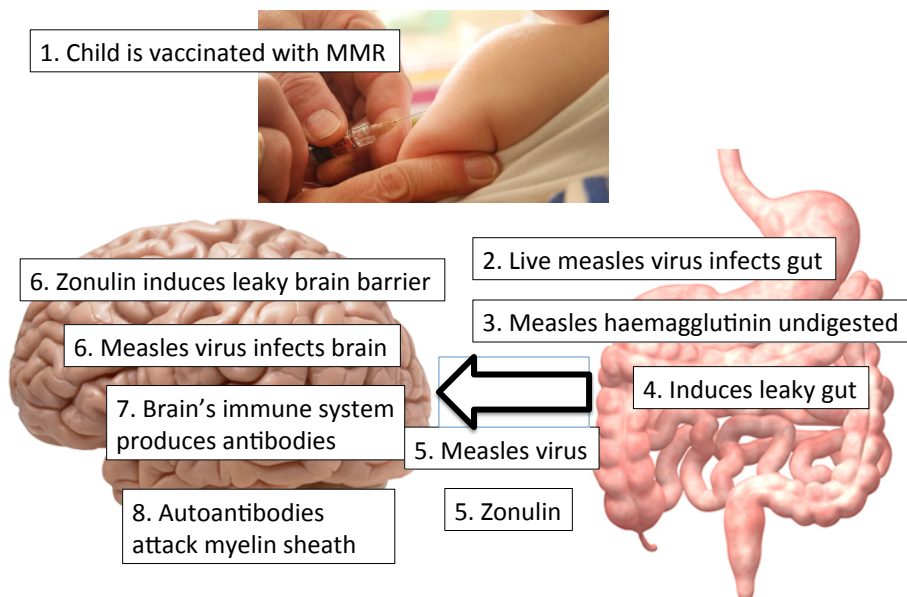
The Purdue Vaccination Studies and Autoantibodies*

“The Purdue studies ... found that vaccinated dogs were developing autoantibodies to their own *collagen*”



*<http://www.dogsnaturallymagazine.com/purdue-vaccination-studies/>

A Scenario



Measles Virus and Haemagglutinin*

- The measles virus synthesizes the protein haemagglutinin
 - Antibodies to haemagglutinin are essential following MMR vaccination to induce immunity
- Measles virus infects brain due to leaky barrier
- Haemagglutinin bears a sequence resemblance to myelin basic protein (MBP) → potential for autoimmune reaction
- MBP is essential for the formation of the myelin sheath surrounding nerve fibers
- Autoantibodies to MBP along with excessive levels of antibodies to measles haemagglutinin are linked to autism**

*Oldstone, MBA, Ed. Molecular mimicry: Infection inducing autoimmune disease. Springer Berlin Heidelberg; January 9, 2006.

**VK Singh et al., J Biomed Sci 2002;9(4):359-64.

Autism and Measles Haemagglutinin*

- 125 autistic children and 92 control children
- 60% of the children with autism had high levels of antibodies to measles haemagglutinin specific to the MMR vaccine
 - 90% of these had autoantibodies to myelin basic protein (MBP)
- 0% of the control children had high antibody titers to either haemagglutinin or MBP
- There were no elevations in antibodies detected against any proteins in the mumps or rubella viruses

*VK Singh et al., J Biomed Sci 2002;9(4):359-64.

Summary

- Glyphosate's insidious cumulative toxicity may be due to its ability to get into proteins by mistake in place of glycine
- Glyphosate has been detected in multiple vaccines, with highest concentrations in MMR
 - Many vaccines include gelatin and fetal bovine serum as ingredients, both of which are contaminated with glyphosate
- Glyphosate and glutamate (from the vaccine) can excite NMDA receptors, and cause neuronal burnout
- Glyphosate contamination leads to resistance to breakdown and autoimmune disease through molecular mimicry
 - A causal link between MMR and autism can be explained through autoimmune attack on myelin basic protein via molecular mimicry with measles haemagglutinin
- Multiple large proteins found in vaccines are allergenic and they may be a causal factor in food allergies and anaphylaxis