¿Cómo acciona el Glifosato en la salud humana?

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II FORO DE REGIONAL DE AGRICULTURA ECOLOGICA EN PIURA

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Alejandro Sacha Barrio Healey

MS Herbal Medicine Yunan University TCM China

ICEAM Diplomate USA

Nanjing Nanjing University of TCM China.

College of Cranio Sacral Osteopathy CCST UK Lic Ac ICOM UK.

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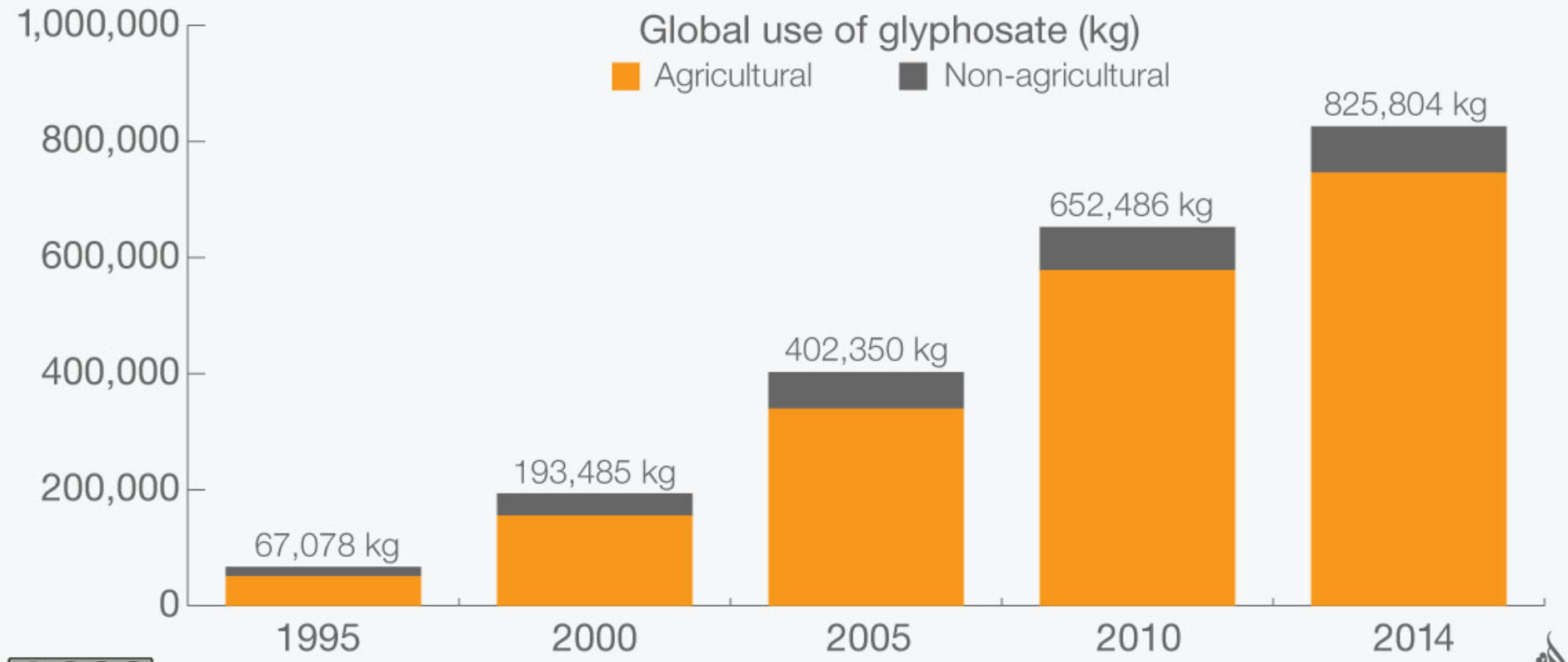
Global use of glyphosate

Glyphosate is the main ingredient for Roundup, one of the world's most used herbicides.

Its use has increased significantly over the last decades.

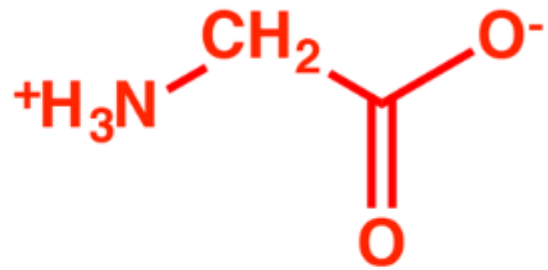


Source: Environmental Sciences Europe (28:3)

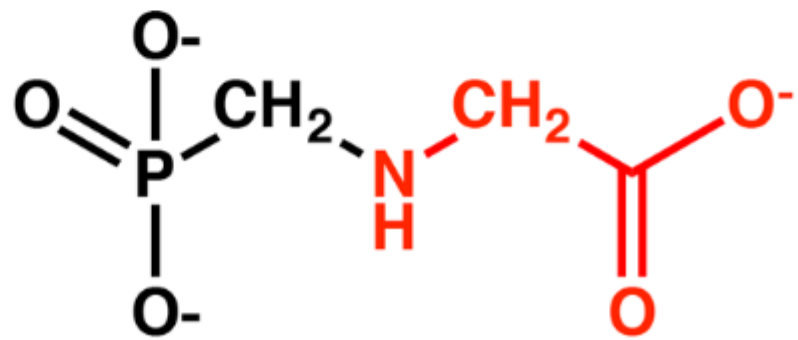
ALJAZEERA

Glycine versus Glyphosate

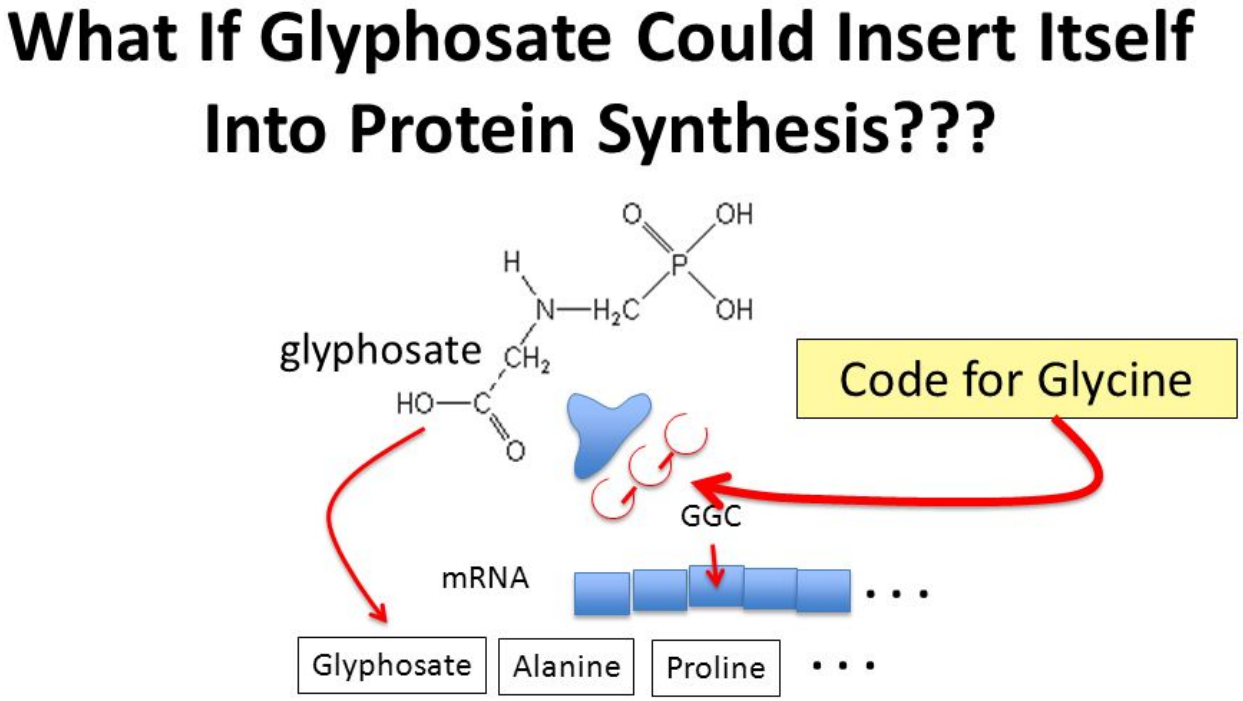
glycine



glyphosate

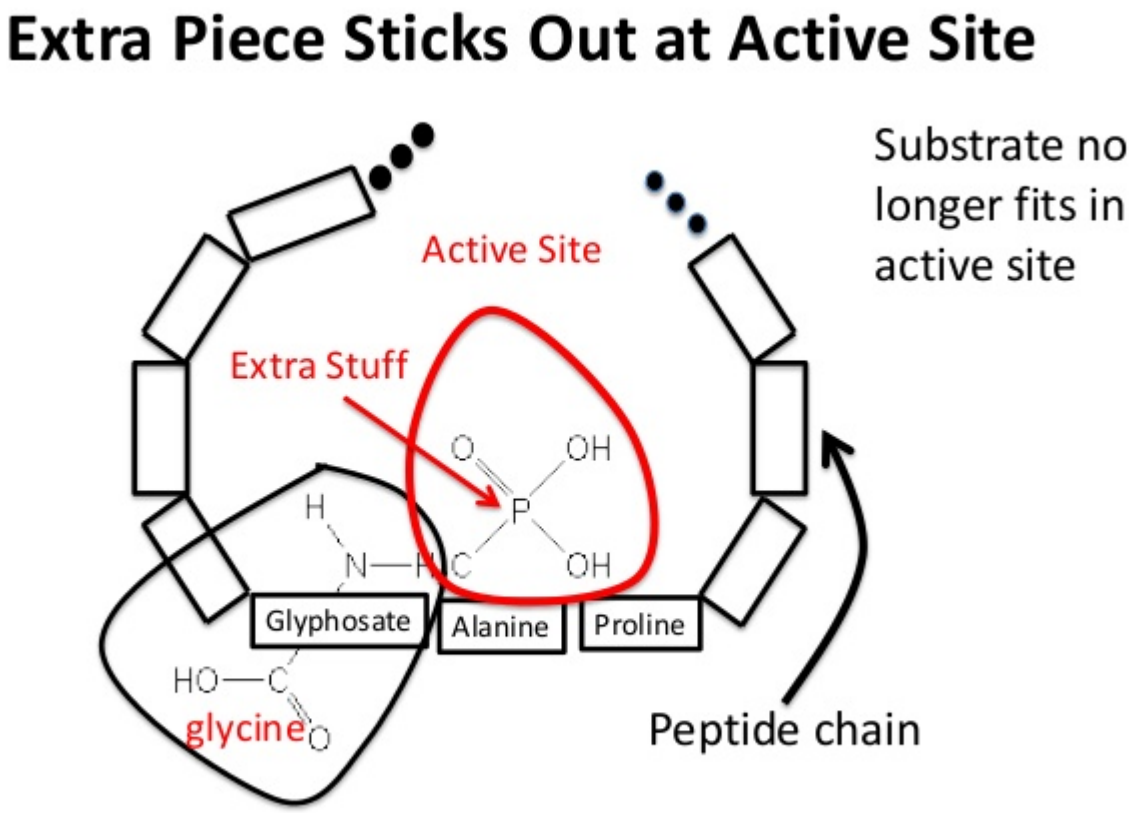


El Glifosato reemplaza a la Glicina en la síntesis de proteínas.



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

Glifosato en Colágeno



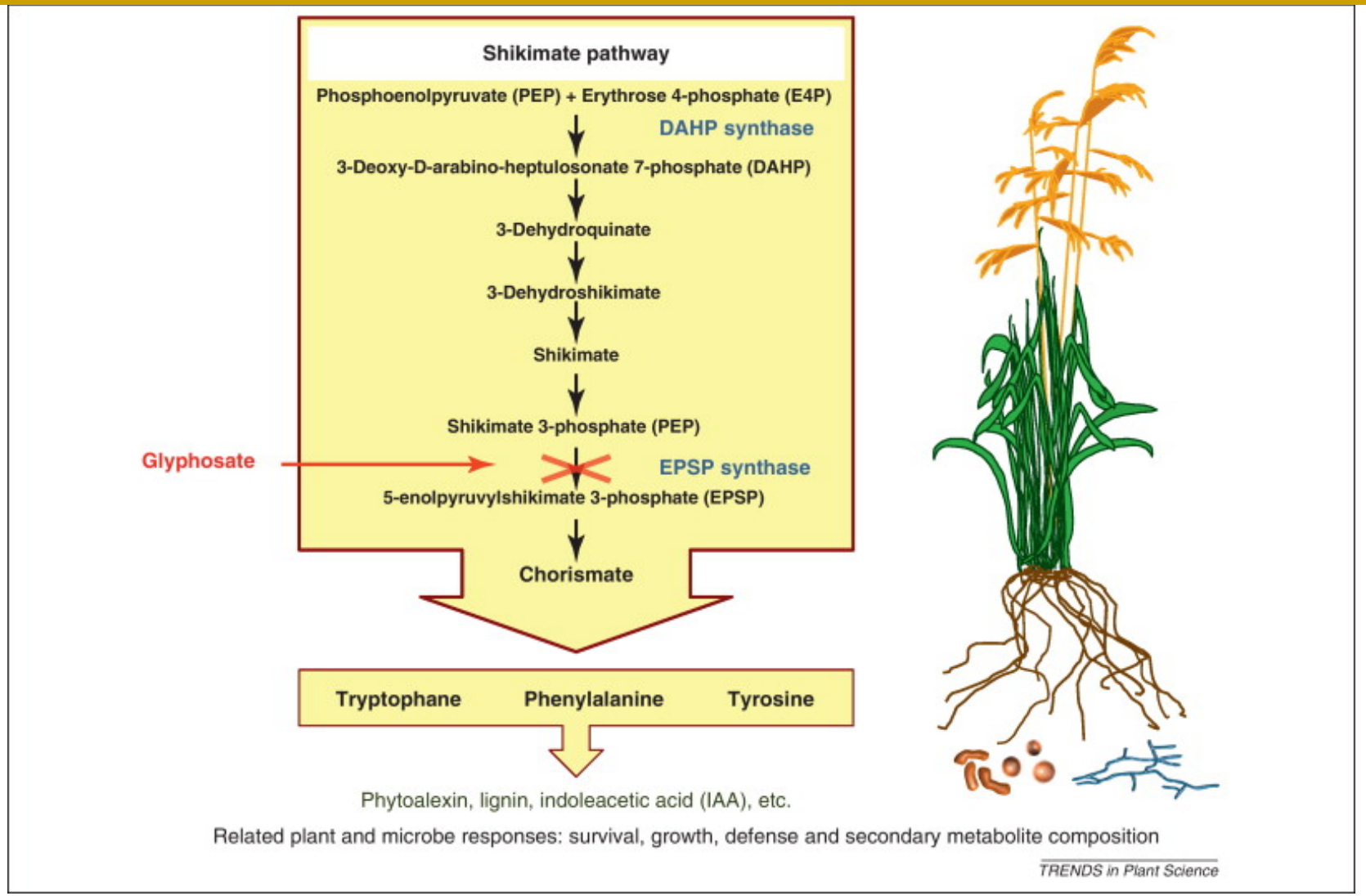
- **EVIDENCE OF GLYCINE SUBSTITUTION BY GLYPHOSATE**
  Glyphosate is a complete glycine molecule except that a hydrogen that normally attaches to the nitrogen atom has been displaced by a methyl phosphonyl group. Glyphosate's ability to disrupt pathways where glycine is normally involved is believed to be part of its toxicity profile, acting as a glycine analogue.[2] The thought had crossed my mind that glyphosate might substitute for glycine during protein synthesis, but I had rejected the idea because I mistakenly believed that the presence of a side chain on the nitrogen atom would prevent glyphosate from joining hands in the paper-doll-like chain.
- However, after Anthony insisted that it could happen, I looked into the matter more deeply, and that was when I realized that the coding amino acid proline also has a carbon substitution for the hydrogen atom normally attached to the nitrogen atom, but has no trouble linking up with the other amino acids. That's when I got really interested in the idea and started to get serious about exploring the consequences.
- What I quickly found out is that protein synthesis is a sloppy process. Lots of mistakes are made, and the approach a cell takes is to take a chance on the mistakes being relatively benign, and then only disassemble and reassemble those proteins that turn out to be flawed in a major way. Probably it is easier to detect protein functional failure or major misfolding than it is to detect and then undo every single mistake during the assembly process, and so this sloppy approach to manufacturing has survived the test of time.
- A study on glyphosate's effects on protein expression in microbes living in the rhizosphere (the soil surrounding the roots of plants) showed that both proteins involved in protein assembly and those involved in protein disassembly were significantly over-expressed in the presence of glyphosate.[3]This strongly suggests that glyphosate was causing a lot more errors during protein synthesis than normal.

Proteínas y Enzimas que codifican glicina que son vulnerables.

Vulnerable Proteins: Resulting Pathologies

Conserved Glycines	Disease Profile
Hormone-sensitive Lipase	Obesity
Insulin Receptor	Diabetes
Amyloid Beta Plaque	Alzheimer's Disease
OGG1	DNA Damage → Cancer
Lipocalin	Kidney Failure
ACTH	Adrenal Insufficiency
Cytochrome C Oxidase	Mitochondrial Disease
Alpha Synuclein	Parkinson's Disease
TDP-43	ALS

Glifosato fue diseñado para bloquear la vía del Shikimato en plantas.

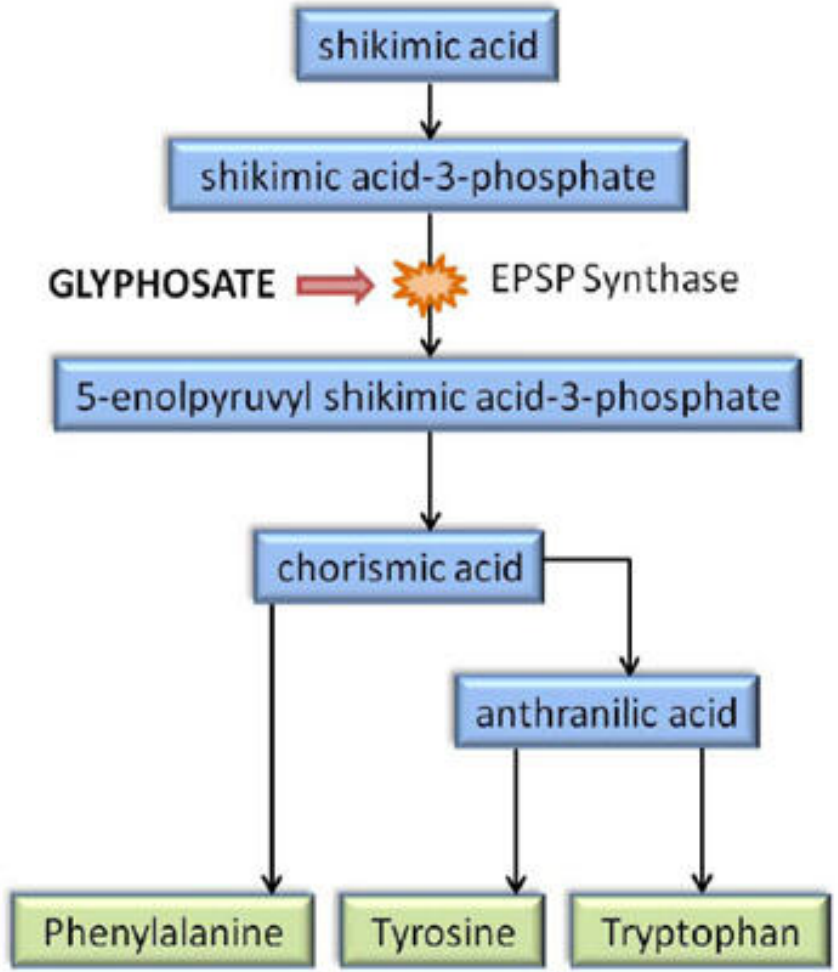


The Site of the Inhibition of the Shikimate Pathway by Glyphosate

I. INHIBITION BY GLYPHOSATE OF PHENYLPROPANOID SYNTHESIS IN BUCKWHEAT (*FAGOPYRUM ESCULENTUM* MOENCH)

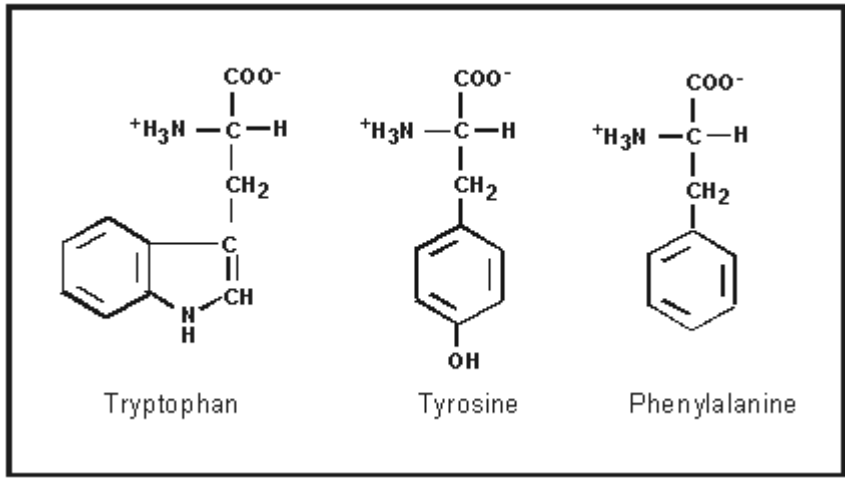
- Abstract
- The nonselective herbicide glyphosate (N-[phosphonomethyl]glycine) inhibited the light-induced accumulation of phenylpropanoid substances (chlorogenic acid, procyanidin, rutin, anthocyanin) in etiolated buckwheat hypocotyls 90% at 1 millimolar. Structurally related compounds, such as N,N-*bis*[phosphonomethyl]glycine, aminomethylphosphonate, methylglycine, and iminodiacetate, had little or no inhibiting effects. Of all amino acids tested, only L-phenylalanine reversed the inhibition, and partial reversal of anthocyanin synthesis was achieved with chorismate, phenylpyruvate, *trans*-cinnamate, *p*-coumarate, and naringenin. Phenylalanine concentrations were reduced in glyphosate-treated hypocotyls, and glyphosate effectively reduced the high level of phenylalanine that was caused by the phenylalanine ammonia-lyase inhibitor L-α-aminooxy-β-phenylpropionate. Glyphosate had no significant effect on the time course of phenylalanine ammonia-lyase activity in hypocotyls incubated either in the dark or in the light. Under appropriate feeding conditions, glyphosate inhibited the incorporation of [^{14}C]shikimate into all three aromatic amino acids, and radioactive shikimate accumulated in the tissue. The results lead to the conclusion that glyphosate interferes with the shikimate pathway at or prior to the formation of chorismate.

En animales bloquea la via del Shikimato a nivel de bacterias intestinales.

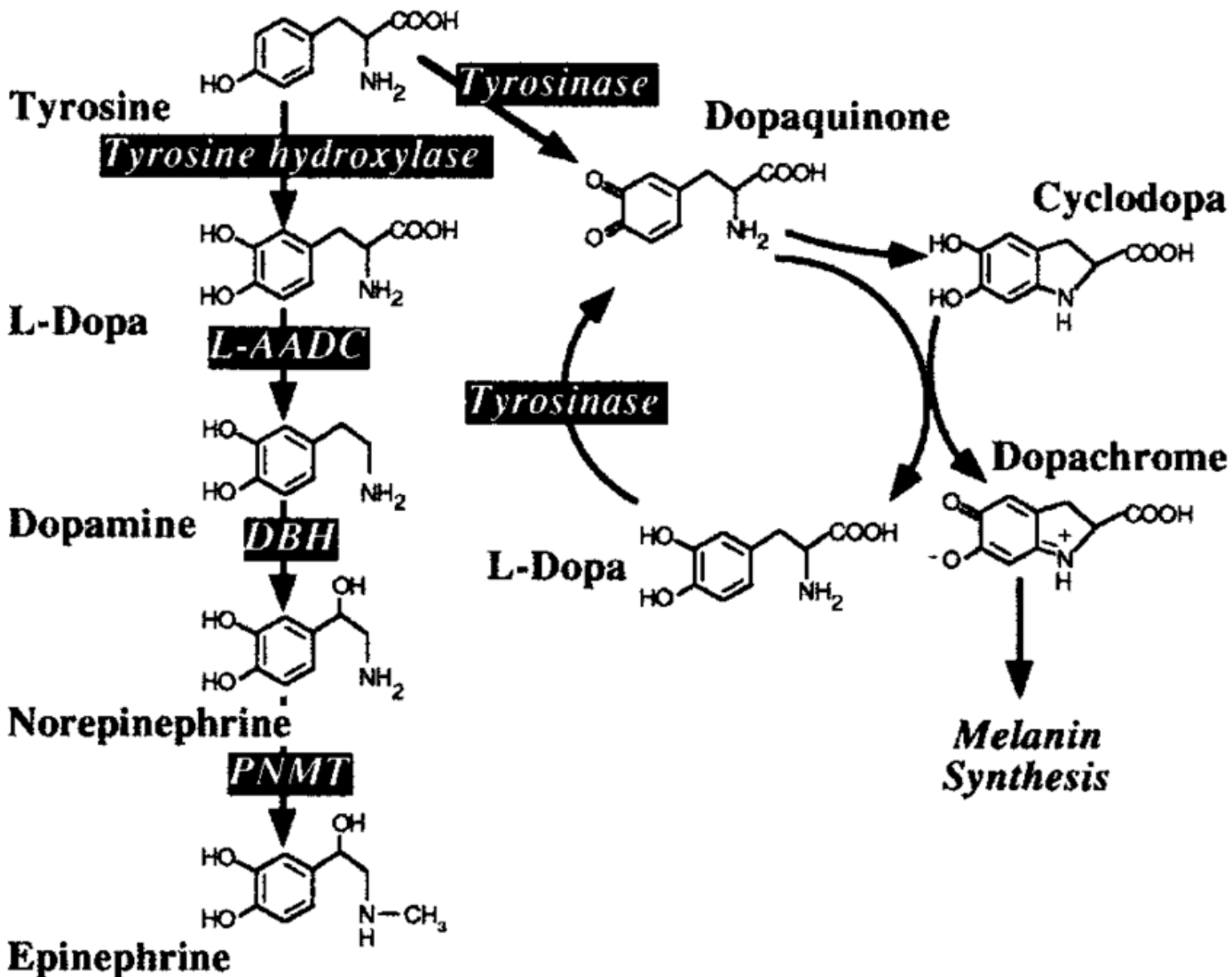


- **Via del Shikimato**:
- La ruta del ácido shikímico es una cadena de reacciones químicas **producida por plantas y en caso de animales por medio de bacterias intestinales**. Una larga lista de metabolitos importantes para la salud derivan de esta ruta. Es crítico para la biosíntesis de aminoácidos aromáticos como, tirosina, triptófano, fenilalanina.
- Si extendemos y derivamos las implicancias vemos que muchos neuro transmisores cerebrales, dopamina, melatonina, serotonina y adrenalina, dependen, de estos aminoácidos esenciales. Bloquear los precursores de neurotransmisores implica al glifosato en enfermedades como alzheimer, autismo, melanoma maligno y cáncer de tiroides

- Muchos neuro transmisores cerebrales; dopamina, melatonina, serotonina y adrenalina, dependen, de estos aminoácidos esenciales. Fenilalanina, triptófano, tirosina, estos **aa** son sintetizados por bacterias intestinales en la llamada la vía del shikimato.

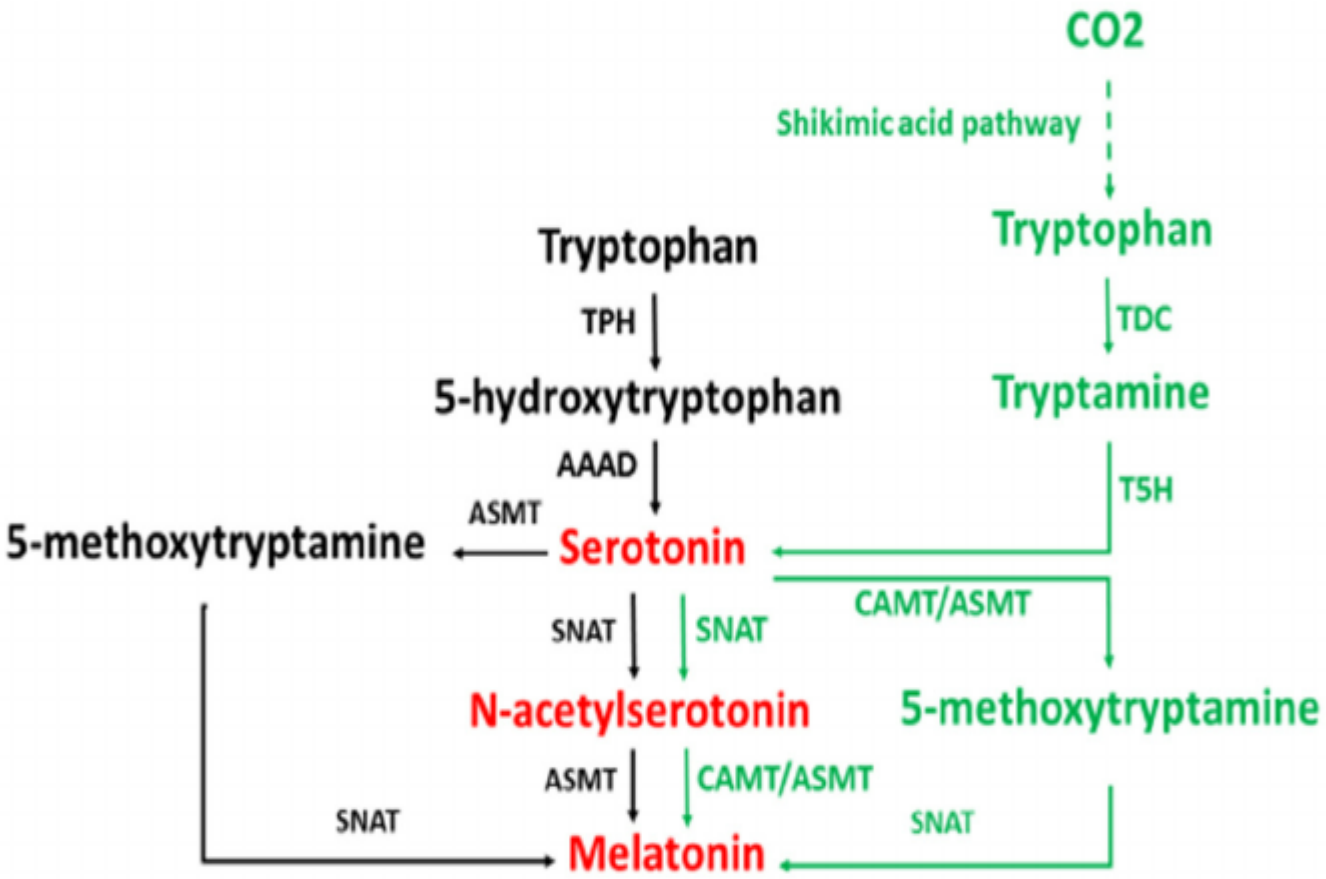


Tirosina amino acido aromático



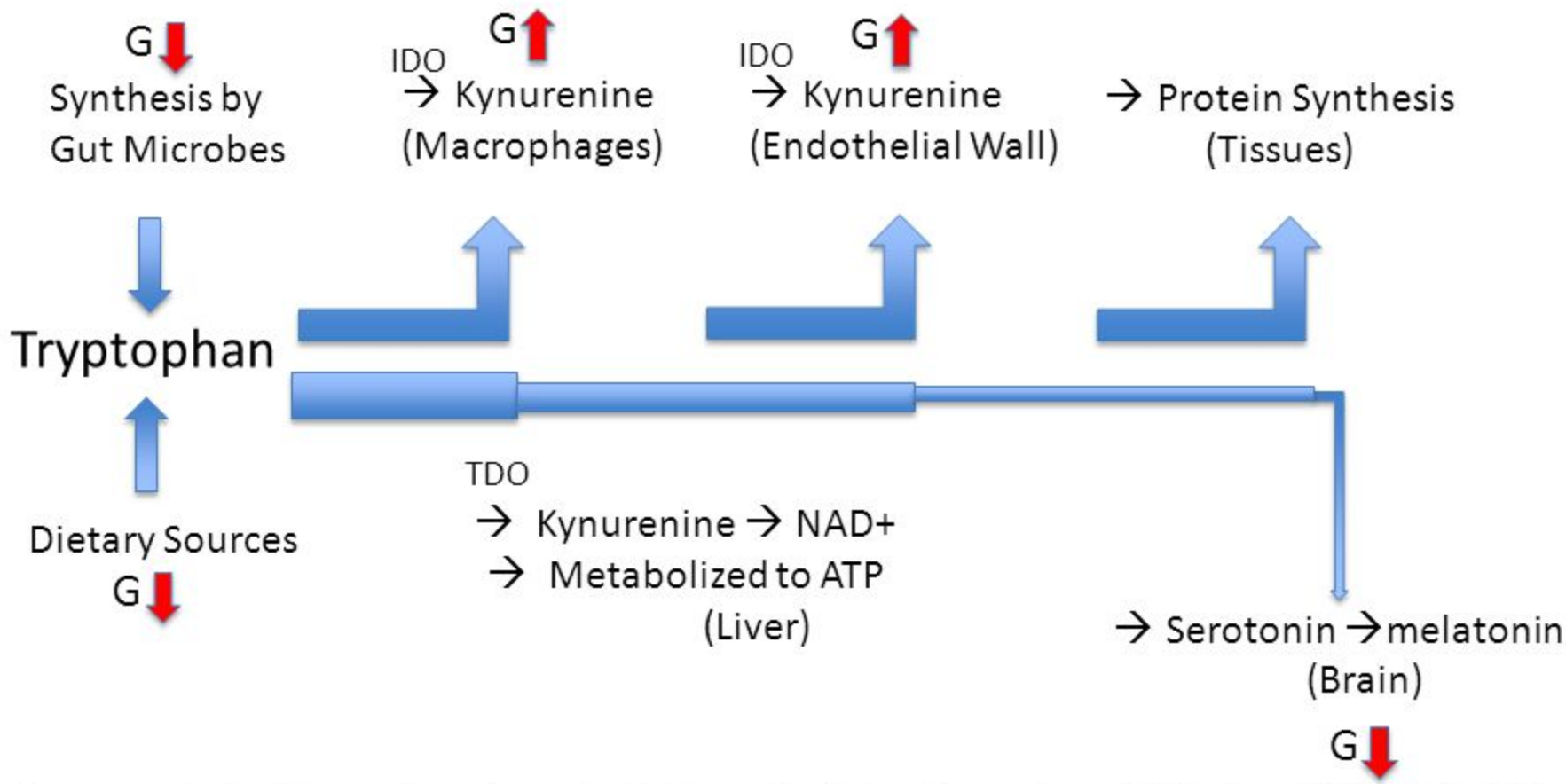
- A tyrosine residue also plays an important role in photosynthesis. In chloroplasts (photosystem II), it acts as an electron donor in the reduction of oxidized chlorophyll. In this process, it loses the hydrogen atom (H+) of its phenolic OH-group. This radical is subsequently reduced in the photosystem II by the four core manganese clusters. Plants and the microbiome make tyrosine from the shikimate pathway and mammals usually get it from the conversion of phenylalanine from foods. That is another aromatic amino acid. When this conversion is made in humans it creates more water. That water is also special. When tyrosine is changed into all the catecholamines in our cells did you know it throws off water in the conversion? What might the purpose of this be to Nature?
- The thyroid hormones triiodothyronine (T3) and thyroxine (T4) in the colloid of the thyroid also are derived from tyrosine in the anterior pituitary.
- Tyrosine is also the precursor to the pigment MELANIN found in the RPE of your eye and the pigment of your skin.
- Tyrosine (or its precursor phenylalanine) is needed to synthesize the benzoquinone structure which forms part of coenzyme Q10 that shuttles electrons from cytochrome 1 to cytochrome 3. This is part of the Q cycle I did an entire webinar on. Do you know that UVA and UVB products tend to inhibit ECT at this level too huh? ;)
- Tyrosine hydroxylase catalyzes the initial and rate-limiting step in the biosynthetic pathway of catecholamines including dopamine, noradrenaline, and adrenaline. Regulation of TH activity is important for a variety of physiological and behavioral functions of these catecholamines.

Triptófano como amino acido aromático tiene efectos sobre la serotonina y melatonina.



How Glyphosate Depletes Serotonin and Melatonin

Serotonin deficiency is linked to not only autism but also obesity, depression, Alzheimer's disease and violent behavior*



*S.L. Connors et al., Plasma Serotonin in Autism. Pediatric Neurology 35(3), Sep 2006, 182-186.

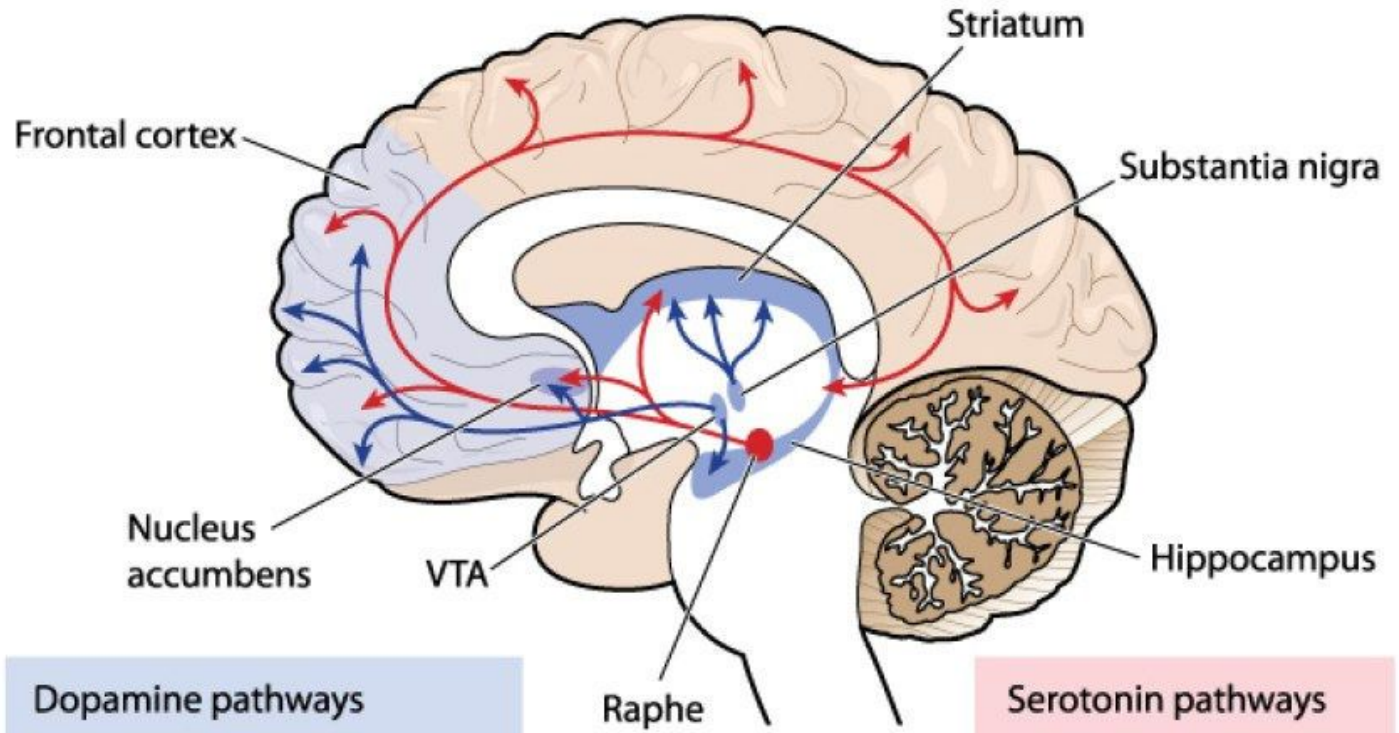
Glyphosate Suppresses Melatonin Synthesis!

- Glyphosate interferes with shikimate pathway in plants and microbes → tryptophan depletion*
- Tryptophan is sole precursor to melatonin
- Melatonin binds to aluminum, cadmium, copper, iron and lead, reducing their toxicity**
- Melatonin is produced by the pineal gland and regulates the wake/sleep cycle

*N. de María et al., J Agric Food Chem 2006, 54, 2621-2628.

**J. Limson et al. J. Pineal Res. 1998; 24:15–21.

Tirosina y Triptófano afectan la vía de la dopamina y serotonina respectivamente.



Dopamine pathways →

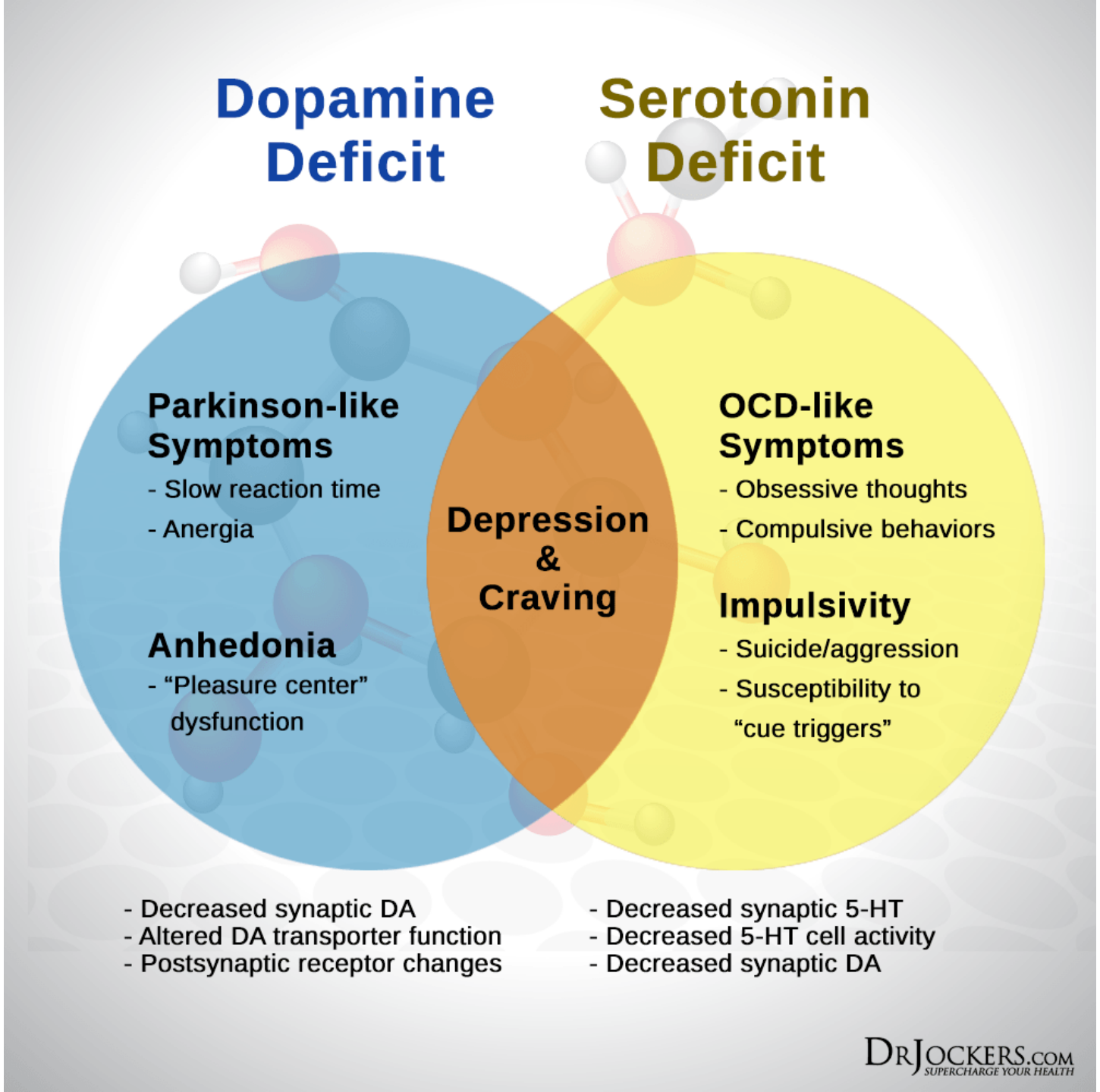
Functions

- Reward (motivation)
- Pleasure, euphoria
- Motor function (fine tuning)
- Compulsion
- Perseveration

Serotonin pathways →

Functions

- Mood
- Memory processing
- Sleep
- Cognition


Dopamine Deficit
Serotonin Deficit
Parkinson-like Symptoms
- Slow reaction time
- Anergia
Anhedonia
- "Pleasure center" dysfunction
Depression & Craving
OCD-like Symptoms
- Obsessive thoughts
- Compulsive behaviors
Impulsivity
- Suicide/aggression
- Susceptibility to "cue triggers"
- Decreased synaptic DA
- Altered DA transporter function
- Postsynaptic receptor changes
- Decreased synaptic 5-HT
- Decreased 5-HT cell activity
- Decreased synaptic DA
DrJockers.com
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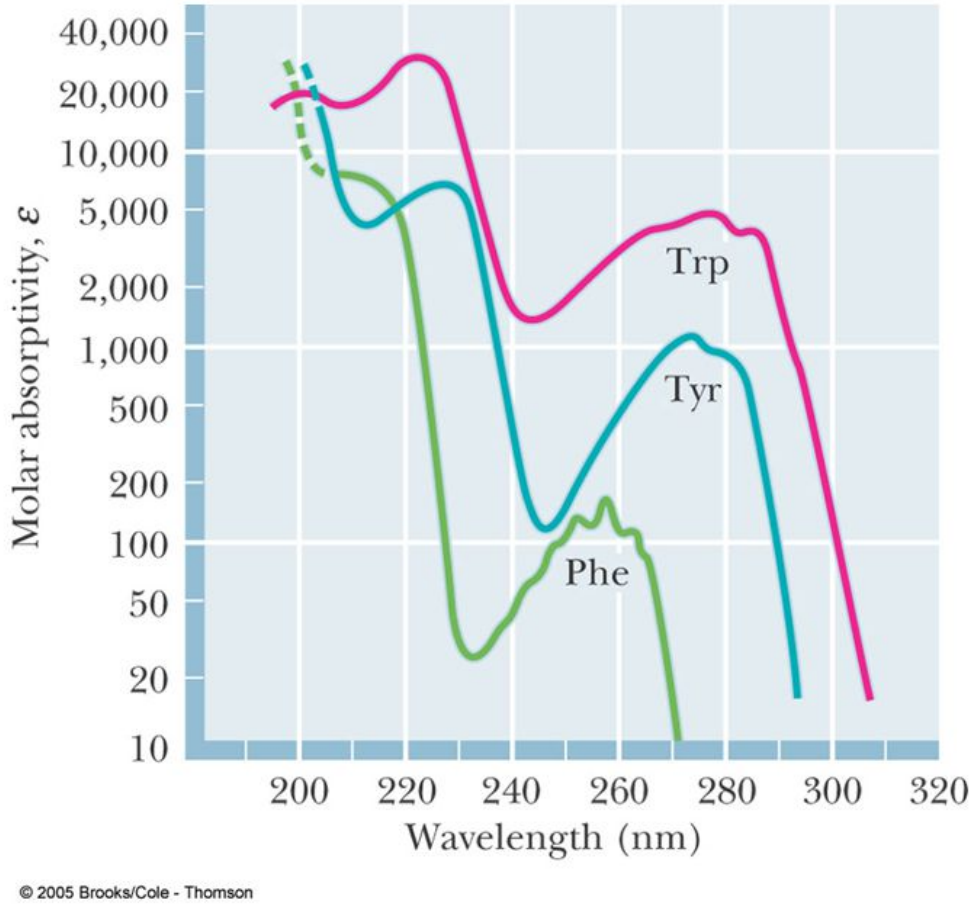
PHENYLALANINE (PHE)

Roles & Uses:

- Used in the manufacture of food and drink products.
- Sold as a nutritional supplement for its reputed analgesic and antidepressant effects.
- The L-isomer is used to biochemically form proteins, coded for by DNA. The codons for L-phenylalanine are UUU and UUC.
- Is a precursor for tyrosine, dopamine, norepinephrine (noradrenaline), and epinephrine (adrenaline), and the skin pigment melanin.
- Starting compound used in the flavonoid biosynthesis.
- The genetic disorder phenylketonuria (PKU) is the inability to metabolize phenylalanine

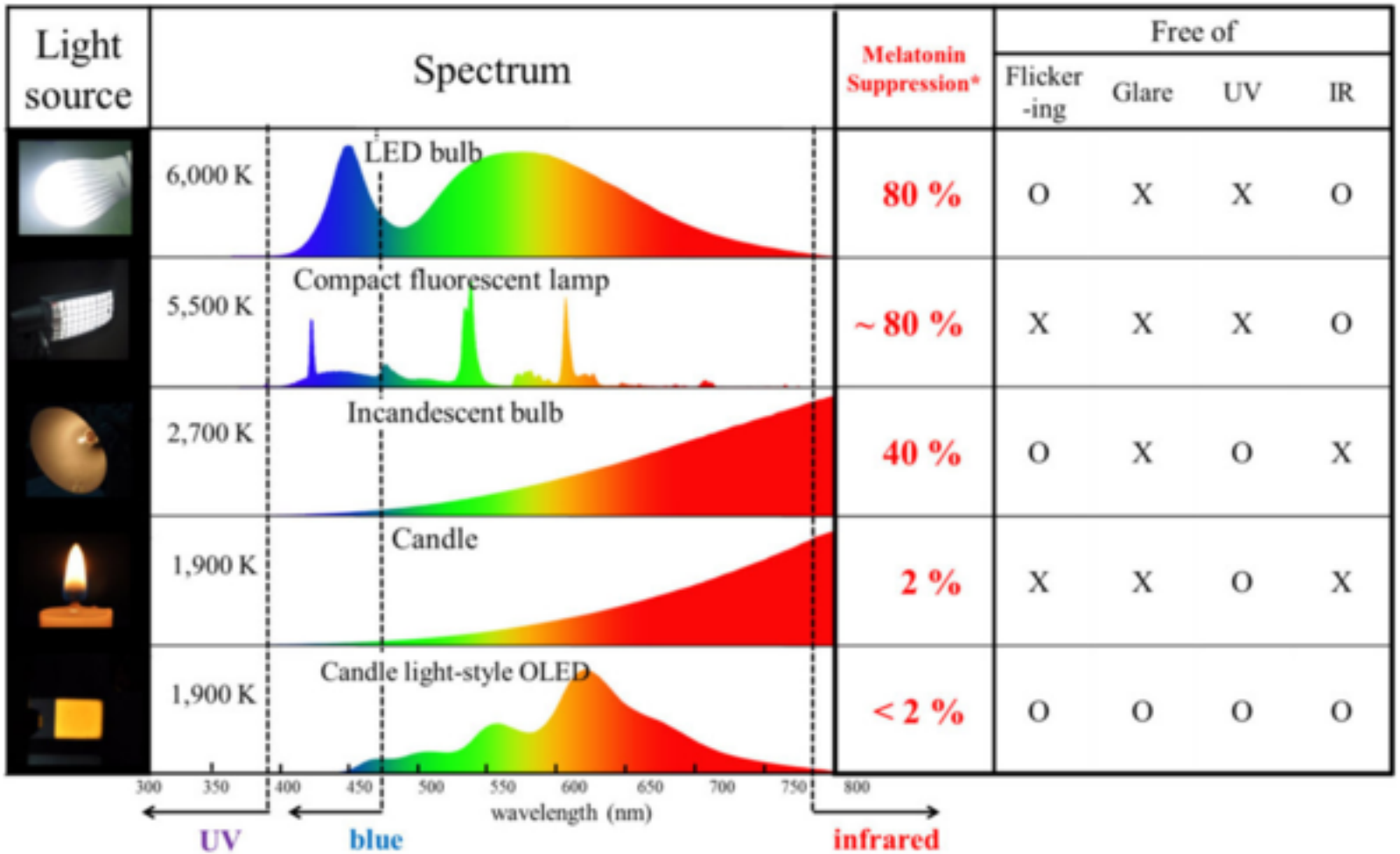
Propiedades especiales de los aa aromáticos

The ultraviolet absorption spectra of the aromatic amino acids at pH 6. (*From Wetlaufer, D.B., 1962. Ultraviolet spectra of proteins and amino acids.* Advances in Protein Chemistry **17**:*303–390.*)

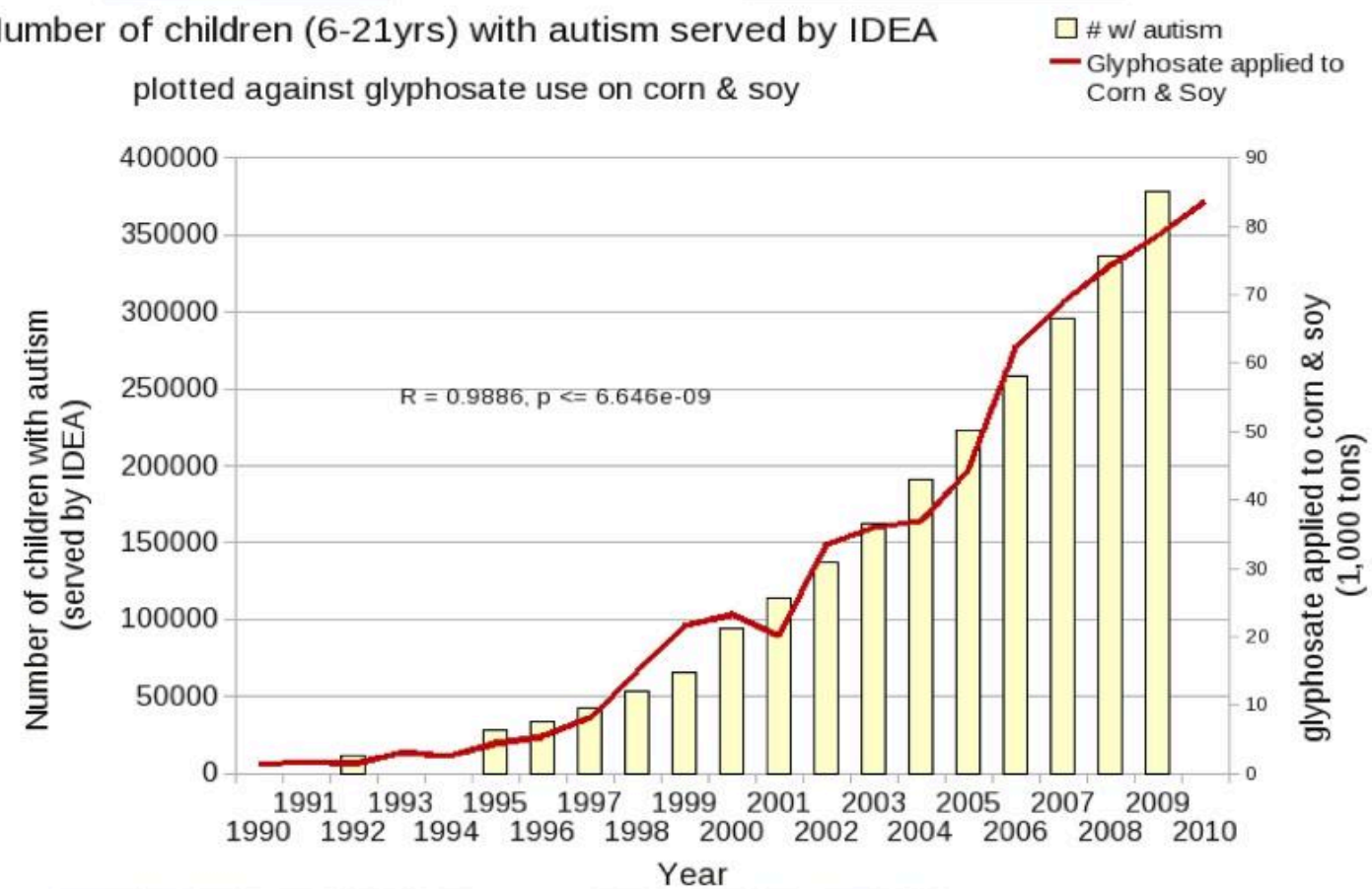


PROPERTIES: AROMATIC AMINO ACIDS

- Relatively **nonpolar**
- Absorb ultraviolet light to different degrees
- Precursors of many important biological compounds, such as neurotransmitters and hormones, in the human organism
- Phe, Tyr and Trp are central molecules in plant metabolism & function as building blocks of proteins
- The three AAA serve as precursors for a variety of plant hormones, such as auxin and salicylate, as well as for a very wide range of aromatic secondary metabolites with multiple biological functions

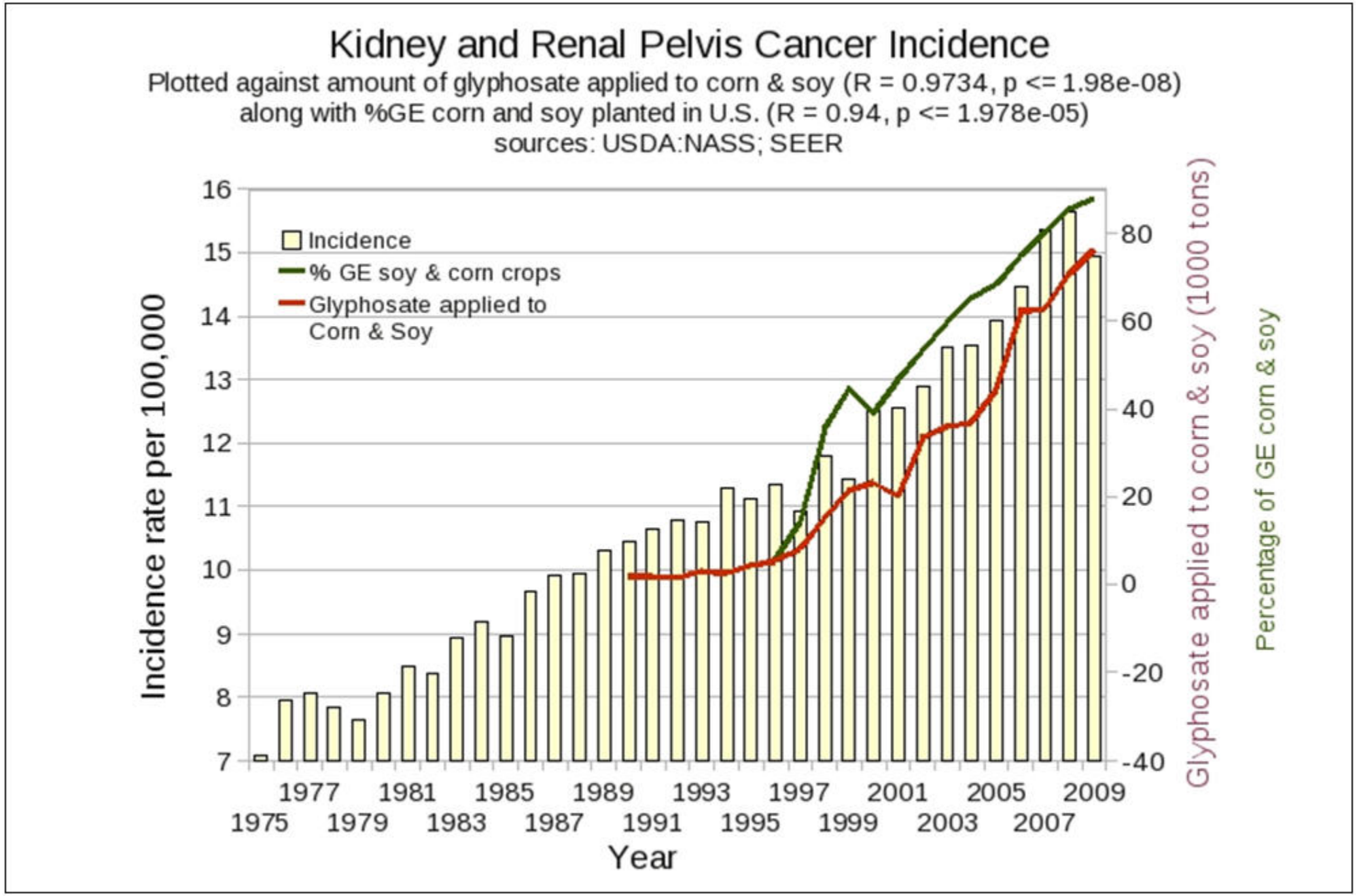

Light source
Spectrum
Melatonin Suppression*
Free of
Flicker -ing
Glare
UV
IR
6,000 K
LED bulb
80 %
O X X O
5,500 K
Compact fluorescent lamp
~ 80 %
X X X O
2,700 K
Incandescent bulb
40 %
O X O X
1,900 K
Candle
2 %
X X O X
1,900 K
Candle light-style OLED
< 2 %
O O O O
300 350 400 450 500 550 600 650 700 750 800
wavelength (nm)
UV
blue
infrared

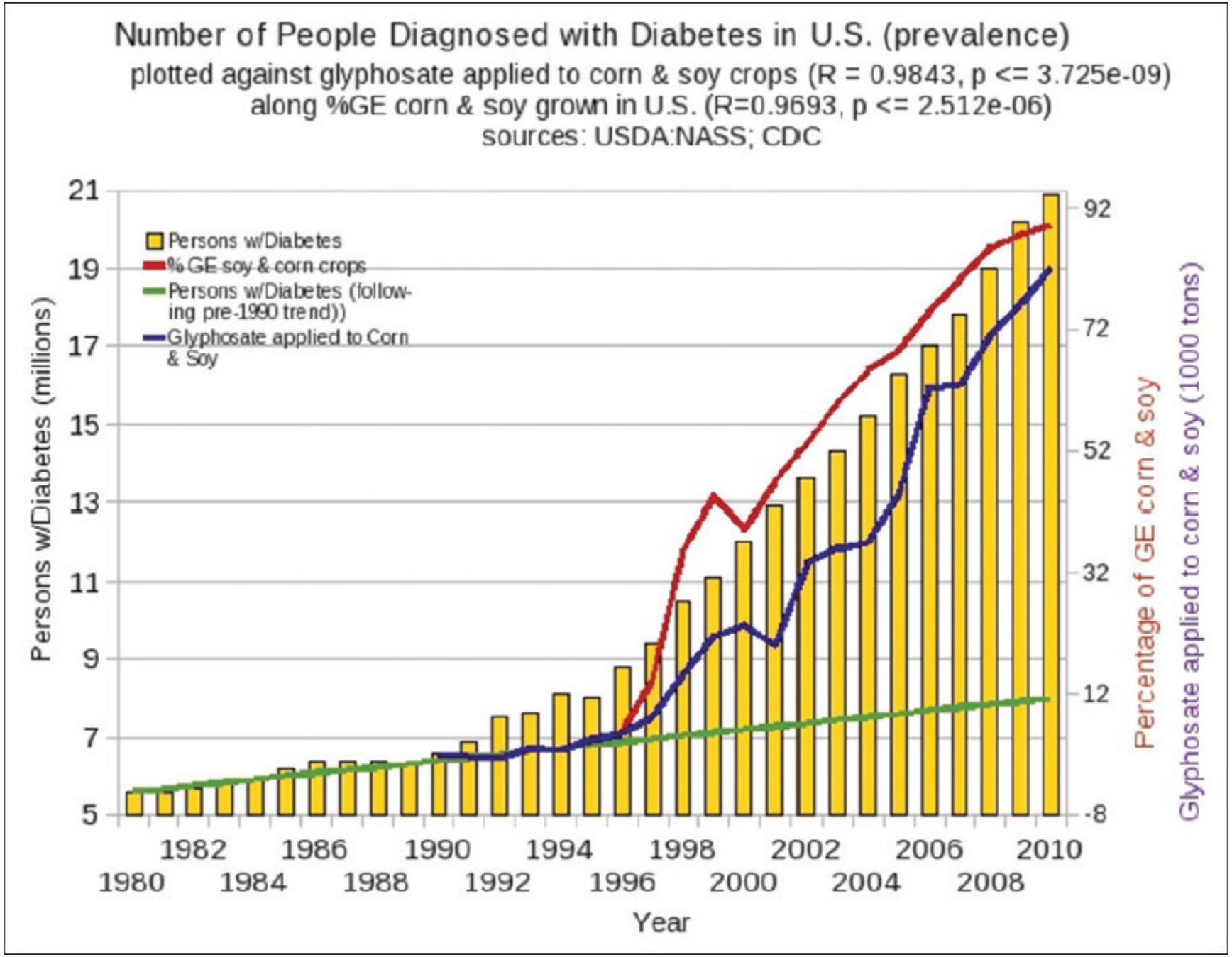
Glyphosate and Autism*

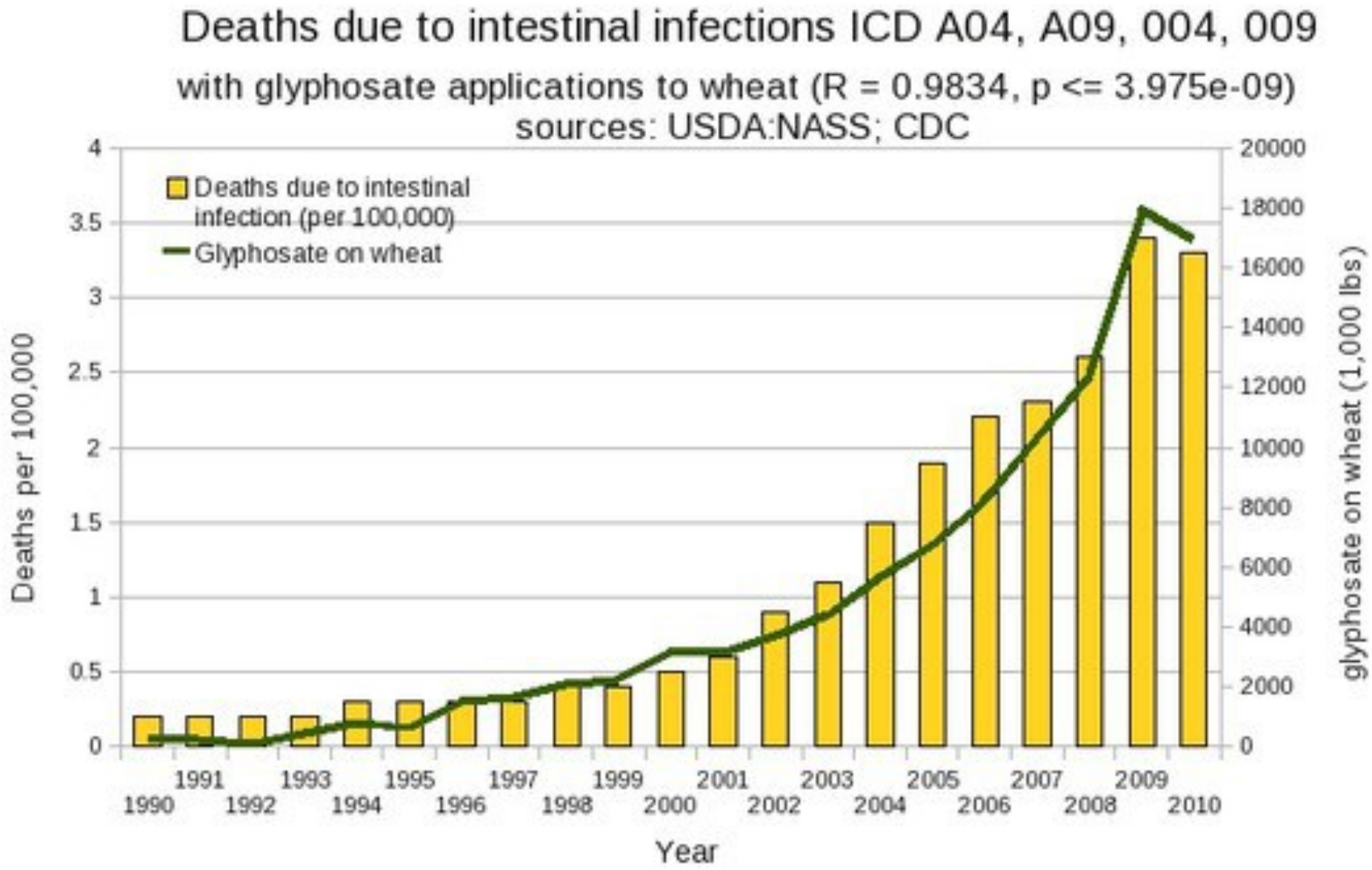


Pearson Correlation Coefficient = 0.985

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


Kidney and Renal Pelvis Cancer Incidence
Plotted against amount of glyphosate applied to corn & soy (R = 0.9734, p <= 1.98e-08)
along with %GE corn and soy planted in U.S. (R = 0.94, p <= 1.978e-05)
sources: USDA:NASS; SEER
Incidence
% GE soy & corn crops
Glyphosate applied to Corn & Soy
Incidence rate per 100,000
Glyphosate applied to corn & soy (1000 tons)
Percentage of GE corn & soy
Year
16
15
14
13
12
11
10
9
8
7
80
60
40
20
0
-20
-40
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009


Number of People Diagnosed with Diabetes in U.S. (prevalence)
plotted against glyphosate applied to corn & soy crops (R = 0.9843, p <= 3.725e-09)
along %GE corn & soy grown in U.S. (R=0.9693, p <= 2.512e-06)
sources: USDA:NASS; CDC
Persons w/Diabetes
% GE soy & corn crops
Persons w/Diabetes (following pre-1990 trend))
Glyphosate applied to Corn & Soy
Persons w/Diabetes (millions)
Percentage of GE corn & soy
Glyphosate applied to corn & soy (1000 tons)
Year
21
19
17
15
13
11
9
7
5
92
72
52
32
12
-8
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010


Deaths due to intestinal infections ICD A04, A09, 004, 009
with glyphosate applications to wheat (R = 0.9834, p <= 3.975e-09)
sources: USDA:NASS; CDC
Deaths due to intestinal infection (per 100,000)
Glyphosate on wheat
Deaths per 100,000
glyphosate on wheat (1,000 lbs)
Year
0
0.5
1
1.5
2
2.5
3
3.5
4
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

- **The Ramazzini Institute 13-week pilot study on glyphosate and Roundup administered at human-equivalent dose to Sprague Dawley rats: effects on the microbiome.**
- Mao Q[1,2], Manservisi F[3,4], Panzacchi S[3], Mandrioli D[3,5], Menghetti I[3], Vornoli A[3], Bua L[3], Falcioni L[3], Lesseur C[6], Chen J[6], Belpoggi F[7], Hu J[1].
- **Author information**
- **Abstract**
- **BACKGROUND:**
- Glyphosate-based herbicides (GBHs) are broad-spectrum herbicides that act on the shikimate pathway in bacteria, fungi, and plants. The possible effects of GBHs on human health are the subject of an intense public debate for both its potential carcinogenic and non-carcinogenic effects, including its effects on microbiome. The present pilot study examines whether exposure to GBHs at doses of glyphosate considered to be "safe" (the US Acceptable Daily Intake - ADI - of 1.75 mg/kg bw/day), starting from in utero, may modify the composition of gut microbiome in Sprague Dawley (SD) rats.
- **METHODS:**
- Glyphosate alone and Roundup, a commercial brand of GBHs, were administered in drinking water at doses comparable to the US glyphosate ADI (1.75 mg/kg bw/day) to F0 dams starting from the gestational day (GD) 6 up to postnatal day (PND) 125. Animal feces were collected at multiple time points from both F0 dams and F1 pups. The gut microbiota of 433 fecal samples were profiled at V3-V4 region of 16S ribosomal RNA gene and further taxonomically assigned and assessed for diversity analysis. We tested the effect of exposure on overall microbiome diversity using PERMANOVA and on individual taxa by LEfSe analysis.
- **RESULTS:**
- Microbiome profiling revealed that low-dose exposure to Roundup and glyphosate resulted in significant and distinctive changes in overall bacterial composition in F1 pups only. Specifically, at PND31, corresponding to pre-pubertal age in humans, relative abundance for Bacteriodetes (Prevotella) was increased while the Firmicutes (Lactobacillus) was reduced in both Roundup and glyphosate exposed F1 pups compared to controls.
- **CONCLUSIONS:**
- This study provides initial evidence that exposures to commonly used GBHs, at doses considered safe, are capable of modifying the gut microbiota in early development, particularly before the onset of puberty. These findings warrant future studies on potential health effects of GBHs in early development such as childhood.

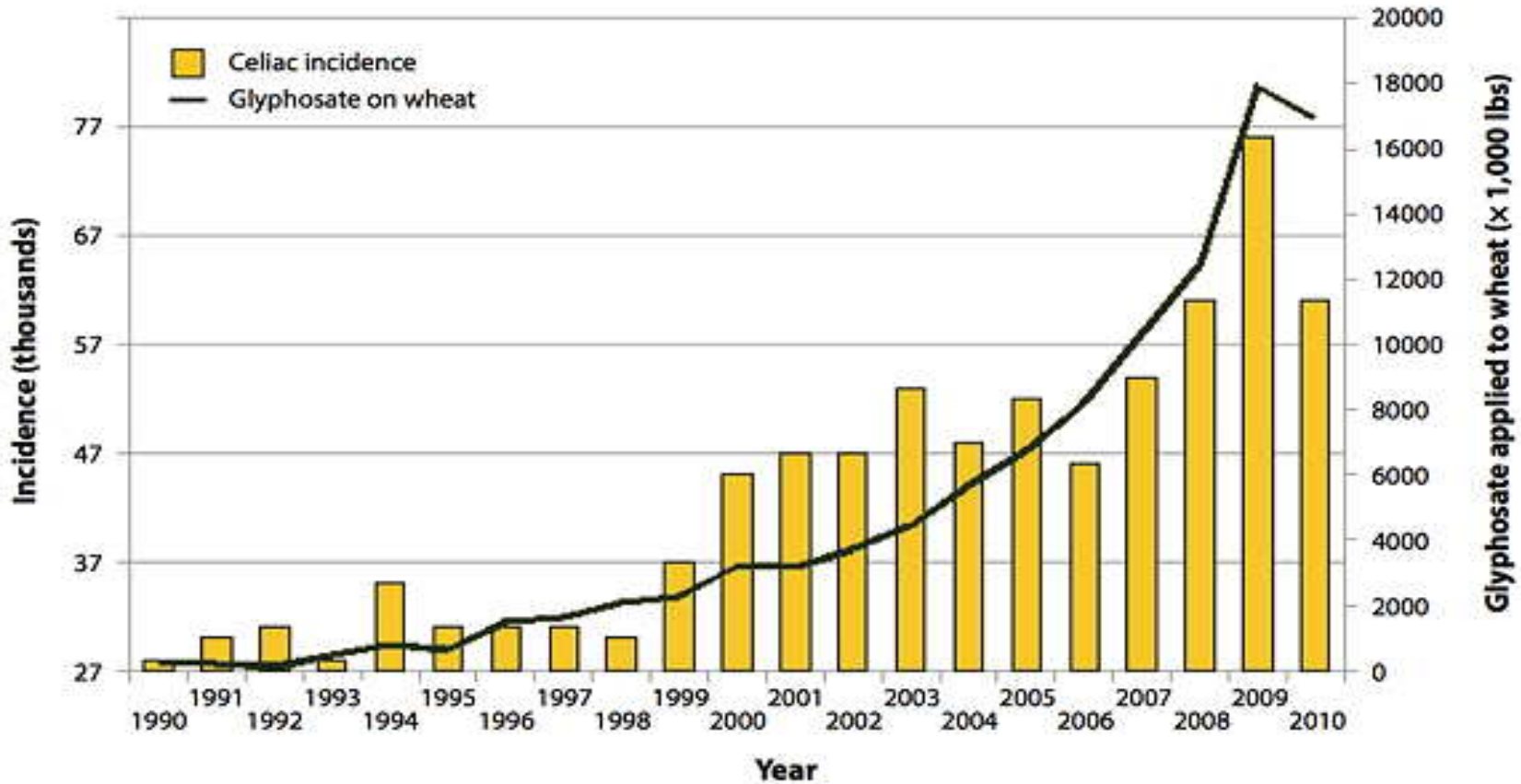
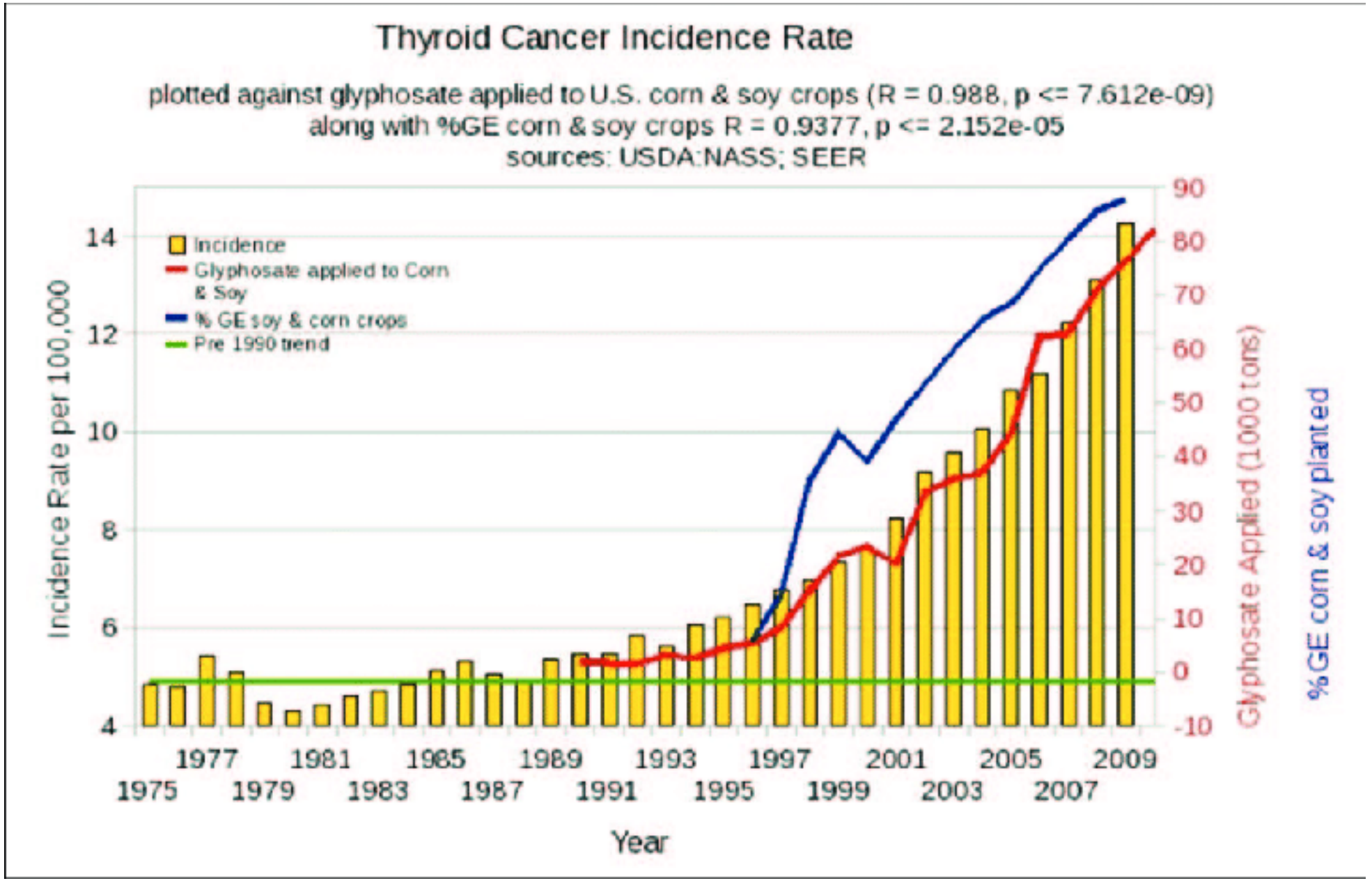


Figure 1. Hospital discharge diagnosis (any) of celiac disease ICD-9 579 and glyphosate applications to wheat (R=0.9759, $p \leq 1.862e\text{-}06$). Sources: USDA:NASS; CDC. (Figure courtesy of Nancy Swanson).


Thyroid Cancer Incidence Rate
plotted against glyphosate applied to U.S. corn & soy crops (R = 0.988, p <= 7.612e-09)
along with %GE corn & soy crops R = 0.9377, p <= 2.152e-05
sources: USDA:NASS; SEER
Incidence
Glyphosate applied to Corn & Soy
% GE soy & corn crops
Pre 1990 trend
Incidence Rate per 100,000
Glyphosate Applied (1000 tons)
%GE corn & soy planted
Year
4
6
8
10
12
14
-10
0
10
20
30
40
50
60
70
80
90
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009

- **Glyphosate-based herbicides and cancer risk: a post-IARC decision review of potential mechanisms, policy and avenues of research.**
- Davoren MJ[1], Schiestl RH[1,2,3].
- **Author information**
- **Abstract**
- Since its initial sales in the 1970s, the herbicide glyphosate attained widespread use in modern agriculture, becoming the most commercially successful and widely used herbicide of all time as of 2016. Despite a primary mechanism that targets a pathway absent from animal cells and regulatory studies showing safety margins orders of magnitude better than many other, more directly toxic herbicides, the safety status of glyphosate has recently been brought into question by a slow accumulation of studies suggesting more subtle health risks, especially when considered in combination with the surfactants it is usually applied with. Current, official views of respected international regulatory and health bodies remain divided on glyphosate's status as a human carcinogen, but the 2015 International Agency for Research on Cancer decision to reclassify the compound as Category 2A (probably carcinogenic to humans) marked a sea change in the scientific community's consensus view. The goal of this review is to consider the state of science regarding glyphosate's potential as a human carcinogen and genotoxin, with particular focus on studies suggesting mechanisms that would go largely undetected in traditional toxicology studies, such as microbiome disruption and endocrine mimicry at very low concentrations.

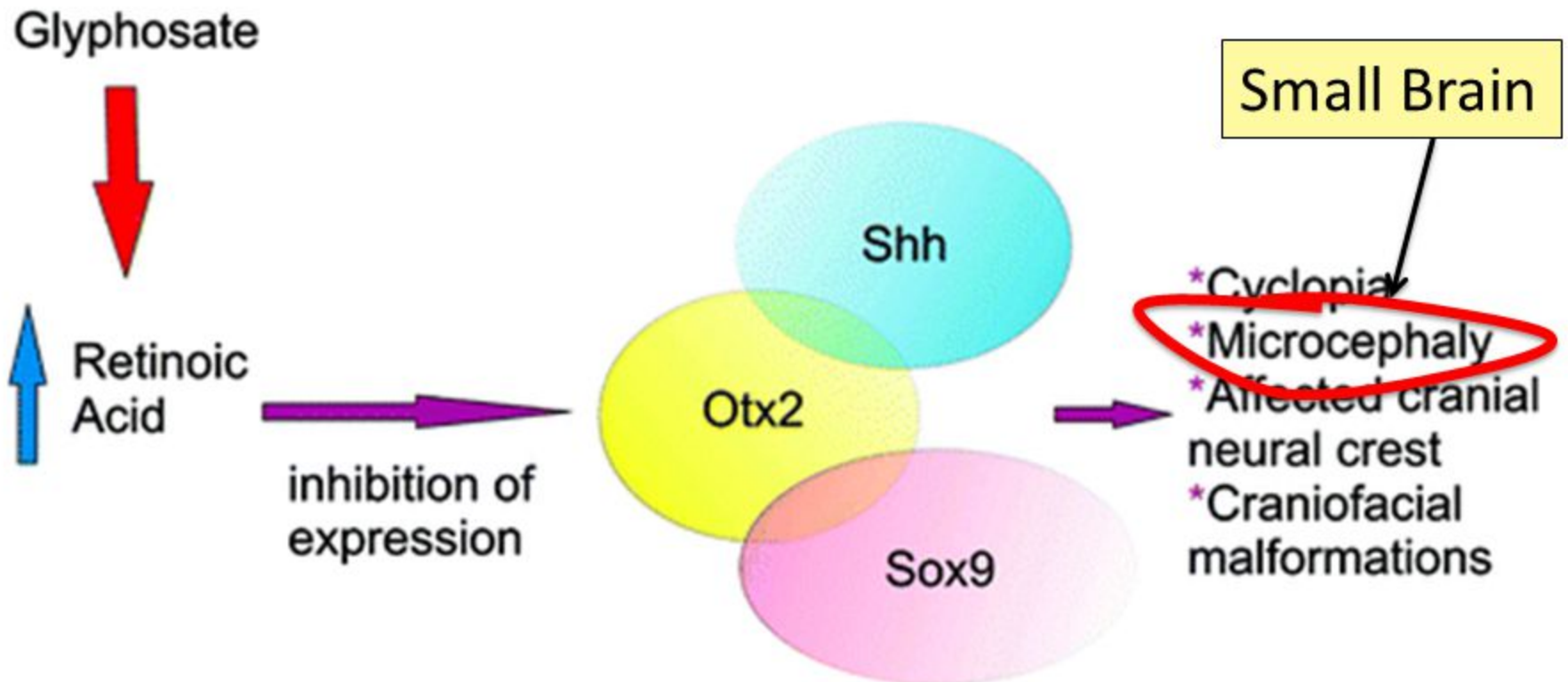
- **Glyphosate induces growth of estrogen receptor alpha positive cholangiocarcinoma cells via non-genomic estrogen receptor/ERK1/2 signaling pathway.**
- Sritana N[1], Suriyo T[2], Kanitwithayanun J[3], Songvasin BH[4], Thiantanawat A[5], Satayavivad J[6].
- **Author information**
- **Abstract**
- Previous studies showed that glyphosate stimulates breast cancer cell growth via estrogen receptors. The present study investigated the effect of glyphosate on the estrogen signaling pathway involved in the induction of cholangiocarcinoma (CCA) cell growth. HuCCA-1, RMCCA-1 and MMNK-1 were chosen for comparison. The effects of glyphosate on cell growth, cell cycle and molecular signaling pathways were measured. The results showed that HuCCA-1 cells expressed estrogen receptor alpha (ERα), while ERα was not detected in RMCCA-1 and MMNK-1 cells. ERα was mostly expressed in cytoplasmic compartment of HuCCA-1 cells. Estradiol (E2) (10^{-11}-10^{-5} M) induced cell proliferation in HuCCA-1 but not in RMCCA-1 and MMNK-1 cells. Glyphosate at the same concentration range also induced HuCCA-1 cell proliferation. The S phase of the cell cycle, and protein levels of the cyclin family were significantly increased after treatment of glyphosate or E2. Both compounds also induced the expression of proliferative signaling-related proteins including ERα, VEGFR2, pERK, PI3K(p85), and PCNA. These effects of glyphosate and E2 were abolished by the ER antagonist, 4-hydroxytamoxifen and U0126, a MEK inhibitor. The data from this study indicate that glyphosate can induce cell growth in ERα positive CCA cells through non-genomic estrogen receptor/ERK1/2 signaling pathway.

The need for independent research on the health effects of glyphosate-based herbicides.

- Landrigan PJ[1], Belpoggi F[2].
- **Author information**

- **Abstract**
- **BACKGROUND:**
- Glyphosate, formulated as Roundup, is the world's most widely used herbicide. Glyphosate is used extensively on genetically modified (GM) food crops designed to tolerate the herbicide, and global use is increasing rapidly. Two recent reviews of glyphosate's health hazards report conflicting results. An independent review by the International Agency for Research on Cancer (IARC) found that glyphosate is a "probable human carcinogen". A review by the European Food Safety Agency (EFSA) found no evidence of carcinogenic hazard. These differing findings have produced regulatory uncertainty.
- **REGULATORY ACTIONS:**
- Reflecting this regulatory uncertainty, the European Commission on November 27 2017, extended authorization for glyphosate for another 5 years, while the European Parliament opposed this decision and issued a call that pesticide approvals be based on peer-reviewed studies by independent scientists rather than on the current system that relies on proprietary industry studies.
- **RAMAZZINI INSTITUTE RESPONSE:**
- The Ramazzini Institute has initiated a pilot study of glyphosate's health hazards that will be followed by an integrated experimental research project. This evaluation will be independent of industry support and entirely sponsored by worldwide crowdfunding. The aim of the Ramazzini Institute project is to explore comprehensively the effects of exposures to glyphosate-based herbicides at current real-world levels on several toxicological endpoints, including carcinogenicity, long-term toxicity, neurotoxicity, endocrine disrupting effects, prenatal developmental toxicity, the microbiome and multi-generational effects.

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.

Otras maneras en que glifosato afecta la salud 1

- **El glifosato es quelante de cobalto y hierro,** lo cual previene que las bacterias intestinales produzcan importantes moléculas como cobalamina y hem.
- **Glifosato va afectar e NOS**
- eNOS, es una enzima necesaria para la síntesis de óxido nítrico, el cual es esencial para el sistema cardiovascular.
- **Destruye bacterias beneficiosas en el intestino.**
- Las bacterias del intestino, lactobacillus dependen de manganeso, el Glifosato es un quelante de manganeso y lo inhabilita para las bacterias intestinales. Una baja concentración de lactobacillus conduce a una elevada concentración de *Clostridium difficile*. Inflamación intestinal es el resultado final. La población de lactobacilos es baja, mientras que *clostridium difficile* es alta en niños con autismo. Hay un eje intestinal cerebral que se ve afectado.
- I**nterfiere con las enzimas citocromo P450**
- **Afecta la glándula tiroidea, creando hipotiroidismo.**
- Inhibe a la glándula pituitaria en producir hormona tiroidea.
- Madres con hipotiroidismo tiene 4 veces mayor probabilidad de tener hijos con autismo. Esta relación enlaza la correlación ambas condiciones con el glifosato.

Otras maneras en que glifosato afecta la salud 2

- **Interfiere con la síntesis de aminoácidos aromáticos y metionina.**
- **Afecta la síntesis y transporte de sulfatos.**
- **Glifosato es nefro-tóxico**. El glifosato entrega el arsénico al riñón. Este estudio publicado en Sri lanka, logró que el país prohibiera el Glifosato.
- **El glifosato está científicamente asociado a los siguientes canceres: Cáncer de páncreas, tiroides, hígado, vejiga, riñón, leucemia mieloide.** (2 Sennef et al)
- **Alzheimer, , obesidad**. Colesterol alto, colon irritable.
- **El glifosato potencia la toxicidad del Aluminio**.
- El glifosato encapsula el aluminio y lo conduce por el cuerpo, en particular a la glándula pineal. Altera la producción de melatonina. La glándula pineal es particularmente vulnerable toxicidad de aluminio.
- **Glifosato es toxico al Riñón.**
- El glifosato conduce al arsénico al Riñón y produce nefro-toxicidad.
- Glifosato está relacionado a glomérulo nefritis.
- **Glifosato crea dolores articulares y condromalacia.**
- Las articulaciones dependen de sulfato de condroitina, esto a su vez depende de manganeso. La síntesis de colágeno requiere altas concentraciones de glicina. Cuando el colágeno no funciona vamos a tener osteoartritis y artritis reumatoide. Aproximadamente una cuarta parte del colágeno está constituido de glicina.
- **Glifosato suprime la activación de la Vitamina D en el hígado.**
- **Glifosato está asociado con mecanismos bilógicos que generan el Autismo**
- **Glifosato genera intestino permeable**.
- Esto a su vez genera un cerebro permeable, facilitando el ingreso de toxinas a la corteza cerebral. El glifosato provoca disbiosis intestinal, inflamación intestinal, y crecimiento de bacterias patógenas.
- **Glifosato agudiza enfermedad celiaca.**
- Glifosato se concentra en muchas proteínas, entre ellas el Gluten.

Mecanismos para desintoxicarnos del Glifosato:

- Elevar niveles de sulfatos. Con verduras crucíferas, col, col de Bruselas, coliflor, ajo, cebolla, mariscos y huevos.
- Carbón activado
- Acido Húmico y Fúlvico
- Taurina, buena fuente azufre
- Baños de sales de Epsom (sulfato de magnesio). Aguas termales.
- Evitar ácido fólico, usar metil-tetrahidro-folato
- Curcumina, es un excelente trasportador de azufre.
- Caminar descalzo.
- Consumir comidas ricas en manganeso. Ostras, hojas verdes, tofu orgánico.

Conclusiones

- 1. Glifosato interfiere en la síntesis de todas las proteínas que llevan glicina
- 2. Glifosato interfiere en la vía del Shikimato en plantas y en el microbioma animal y humano.
- 3. La interferencia sobre amino ácidos aromáticos esta implicado en patologías asociadas a Alzheimer, párkinson, cáncer, diabetes, autismo.
- 4. Glifosato es quelante de manganeso.

MUCHAS GRACIAS

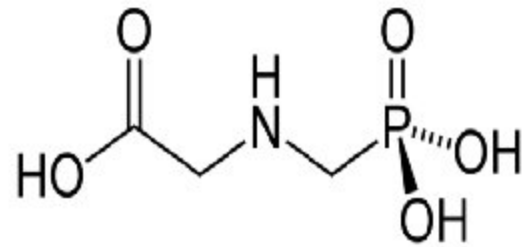
sbarrio@avantari.com

Glyphosate - N-(phosphonomethyl) glycine

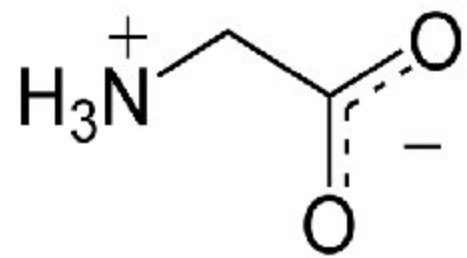
- An aminophosphonic analogue of the natural amino acid ***glycine***.

- It is absorbed through foliage and translocated to ***actively growing points***. (***Meristems!!!***)

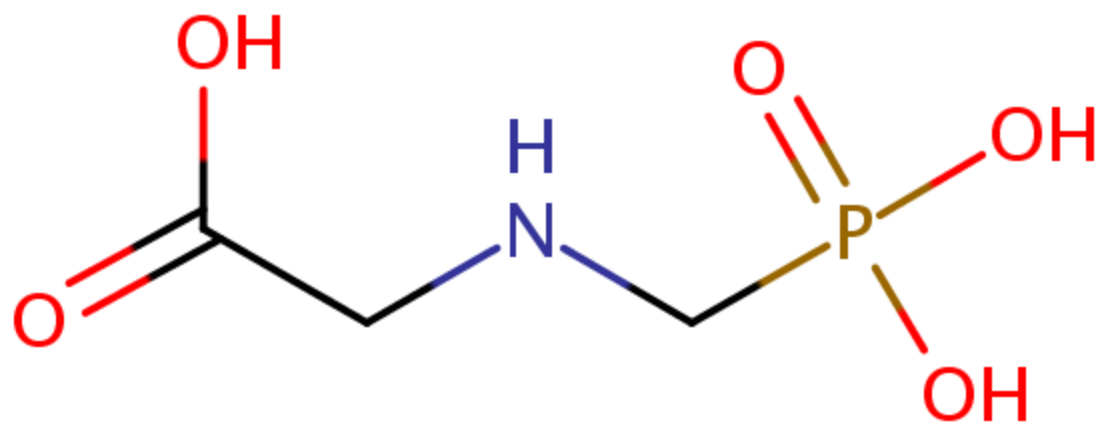
- Mode of action is to ***inhibit an enzyme involved in the synthesis of the aromatic amino acids:***
- ***tyrosine,***
- ***tryptophan***
- ***phenylalanine***



Glyphosate



Glycine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H
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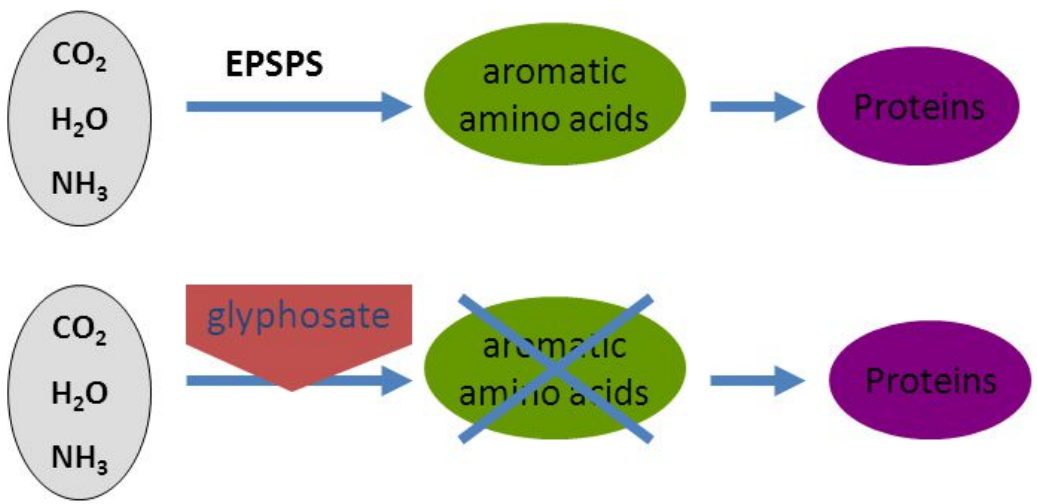
P
OH
OH

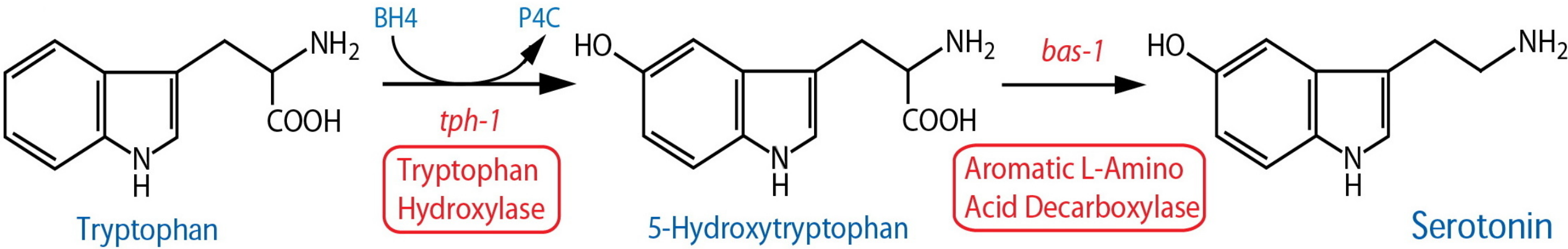
Glyphosate Herbicide

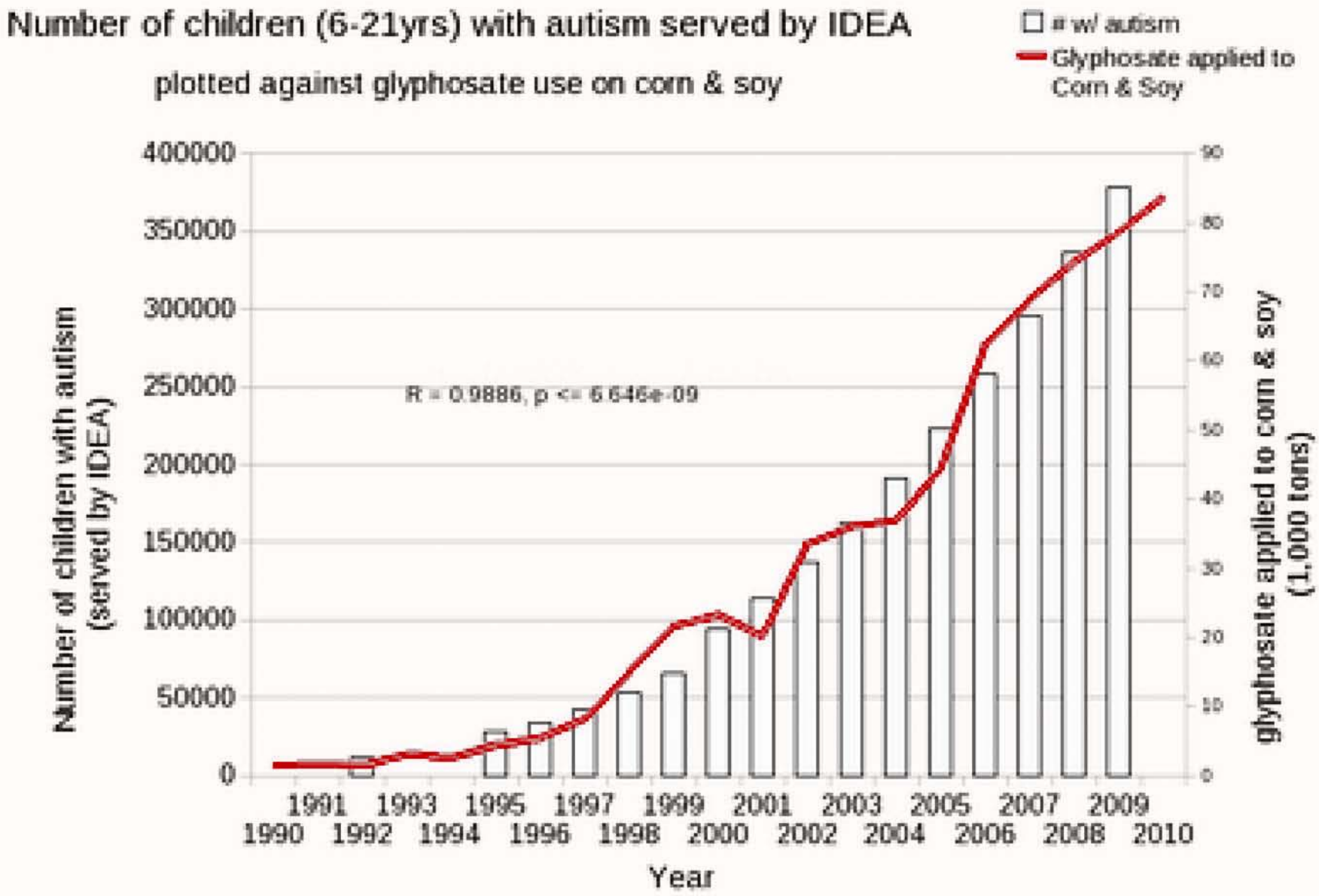
- Glyphosate inhibits EPSPS enzyme - impeding the synthesis of aromatic amino acids



- **Via del Shikimato**:
- La ruta del ácido shikímico es una cadena de reacciones químicas **producida por plantas y en caso de animales por medio de bacterias intestinales**. Una larga lista de metabolitos importantes para la salud derivan de esta ruta. Es crítico para la biosíntesis de aminoácidos aromáticos como, tirosina, triptófano, fenilalanina.
- Si extendemos y derivamos las implicancias vemos que muchos neuro transmisores cerebrales, dopamina, melatonina, serotonina y adrenalina, dependen, de estos aminoácidos esenciales. Bloquear los precursores de neurotransmisores implica al glifosato en enfermedades como alzheimer, autismo, melanoma maligno y cáncer de tiroides

Triptófano amino acido aromático




Number of children (6-21yrs) with autism served by IDEA
plotted against glyphosate use on corn & soy
w/ autism
Glyphosate applied to Corn & Soy
R = 0.9886, p <= 6.646e-09
Number of children with autism (served by IDEA)
glyphosate applied to corn & soy (1,000 tons)
Year
0
50000
100000
150000
200000
250000
300000
350000
400000
0
10
20
30
40
50
60
70
80
90
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Glyphosate in Collagen: Widespread Consequences

- **EVIDENCE OF GLYCINE SUBSTITUTION BY GLYPHOSATE**
  Glyphosate is a complete glycine molecule except that a hydrogen that normally attaches to the nitrogen atom has been displaced by a methyl phosphonyl group. Glyphosate's ability to disrupt pathways where glycine is normally involved is believed to be part of its toxicity profile, acting as a glycine analogue.[2] The thought had crossed my mind that glyphosate might substitute for glycine during protein synthesis, but I had rejected the idea because I mistakenly believed that the presence of a side chain on the nitrogen atom would prevent glyphosate from joining hands in the paper-doll-like chain.
- However, after Anthony insisted that it could happen, I looked into the matter more deeply, and that was when I realized that the coding amino acid proline also has a carbon substitution for the hydrogen atom normally attached to the nitrogen atom, but has no trouble linking up with the other amino acids. That's when I got really interested in the idea and started to get serious about exploring the consequences.
- What I quickly found out is that protein synthesis is a sloppy process. Lots of mistakes are made, and the approach a cell takes is to take a chance on the mistakes being relatively benign, and then only disassemble and reassemble those proteins that turn out to be flawed in a major way. Probably it is easier to detect protein functional failure or major misfolding than it is to detect and then undo every single mistake during the assembly process, and so this sloppy approach to manufacturing has survived the test of time.
- A study on glyphosate's effects on protein expression in microbes living in the rhizosphere (the soil surrounding the roots of plants) showed that both proteins involved in protein assembly and those involved in protein disassembly were significantly over-expressed in the presence of glyphosate.[3]This strongly suggests that glyphosate was causing a lot more errors during protein synthesis than normal.