

## **Data trends show correlations between increases in organ diseases and GMOs**

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Prevalence and incidence data show correlations between diseases of the organs and the increase in Genetically Modified Organisms (GMOs) in the food supply, along with the increase in glyphosate-based herbicide applications (see slide show). More and more studies have revealed carcinogenic and endocrine disrupting effects of Roundup at lower doses than those authorized for residues found in Genetically Modified Organisms (see notes below).

### **What is an endocrine disruptor?**

The endocrine system controls the body's chemical messages through hormones. Hormones are secreted directly into the blood by the endocrine glands: pineal, hypothalamus, pituitary, adrenal, thyroid, thymus, pancreas, ovaries and testes. The glands release carefully measured amounts of chemicals into the bloodstream to regulate important functions including growth and development, reproduction, healthy weight, mood and organ performance. An endocrine disruptor is a chemical that either mimics or blocks hormones and disrupts the body's normal functions. This disruption can happen through altering normal hormone levels, halting or stimulating the production of hormones, or interacting directly with the organ the hormone was meant to regulate. Because hormones work at very small doses, endocrine disruption can occur from [low-dose exposure](#) to hormonally active chemicals. Low doses over long periods of time may lead to very serious illnesses.

### **What are the effects of endocrine disruption?**

Endocrine disruptors can lead to failure in all systems in the body that are controlled by hormones. Imbalances and malfunctions of the endocrine system can lead to diabetes, kidney disease, hypertension, obesity, osteoporosis, Cushing's syndrome, hypo- and hyperthyroidism, infertility, birth defects, erectile dysfunction, cancer (breast, prostate, liver, brain, thyroid, non-Hodgkin's lymphoma), sexual development problems, neurological disorders (learning disabilities, attention deficit disorder, autism, dementia, Alzheimer's, Parkinson's, schizophrenia) among others. Endocrine disruptors are especially damaging to growth in fetuses, babies and children.

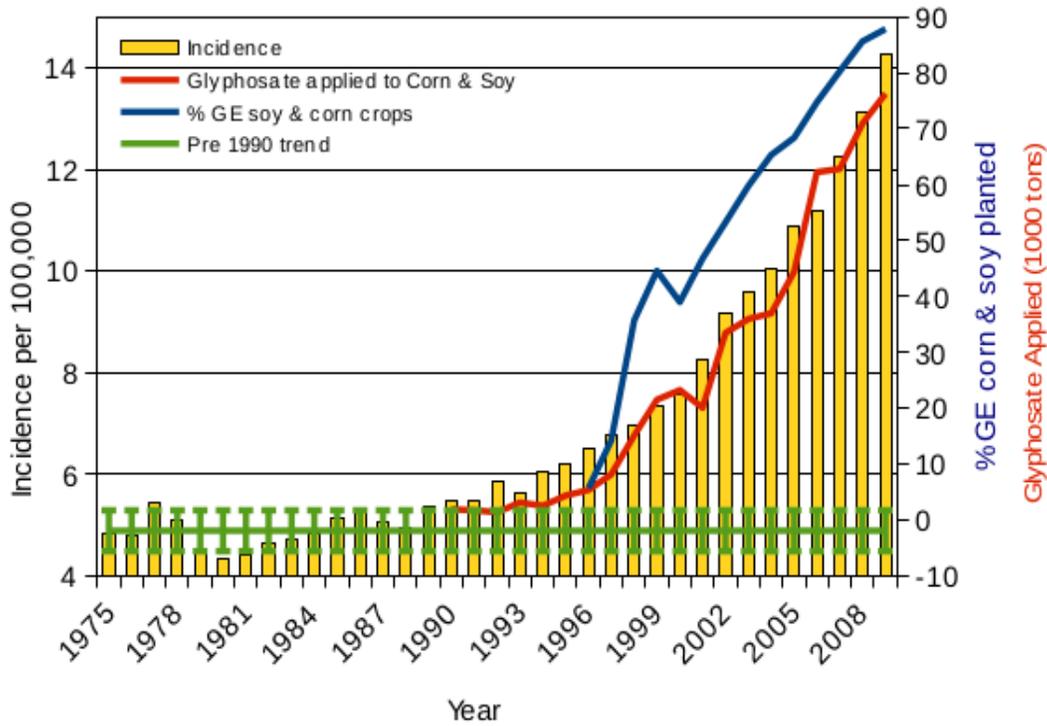
### **Correlations between the increase in glyphosate use on crops and organ disease**

It was shown in previous articles that there has been a huge increase in the amount of [glyphosates](#) applied to corn and soy crops grown in the U.S. corresponding to the [rise in the percentage](#) of corn and soy planted with genetically engineered (GE) varieties. Those data represent only a portion of the total GE crops and amount of glyphosates applied. The USDA only collects data on GE crops for corn, cotton and soy. Since most of the corn (88%) and soy (94%) planted now is GE, these data give a representation of the rising trends in both GE crops and herbicide use. Glyphosate was first marketed for weed control under the trade name Roundup™ in 1976 but data are not available before 1990.

If GE crops and associated glyphosate use are causing diseases of the organs, one would expect to see a correlation in the data. The data for corn and soy crops have been plotted against the incidence rates (new cases reported per year) of cancers of the thyroid and liver. Cancers of the thyroid and liver especially seem to track with the advent of GE crops and associated glyphosate applications. Thyroid cancer seems to affect women more often, while males are more susceptible to liver cancer. This is in agreement with data in rats reported by [Séralini et al.](#) "... the sex hormonal balance was modified by GMO and Roundup treatments. In treated males, liver congestions and necrosis were 2.5–5.5 times

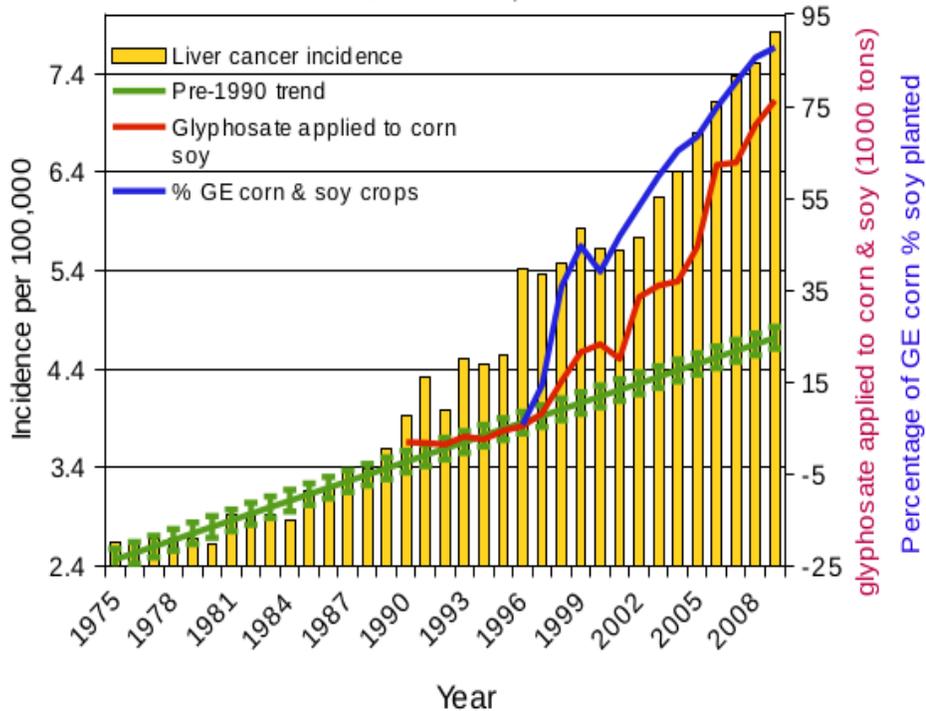
## Thyroid Cancer Incidence Rate (age adjusted)

plotted against glyphosate applied to U.S. corn & soy ( $R = 0.988$ ,  $p \leq 7.612e-09$ )  
 along with %GE corn & soy crops  $R = 0.9377$ ,  $p \leq 2.152e-05$   
 sources: USDA:NASS; SEER



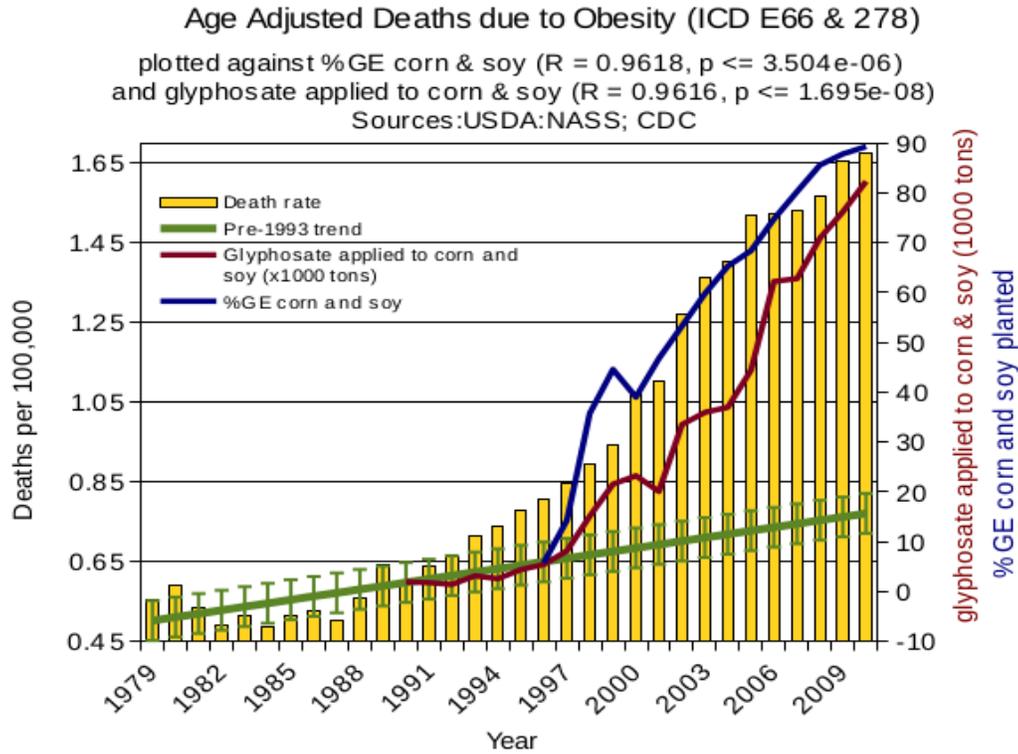
## Liver and Intrahepatic Bile Duct Cancer Incidence (age adjusted)

plotted against glyphosate applied to corn & soy ( $R = 0.9596$ ,  $p \leq 4.624e-08$ )  
 along with %GE corn & soy planted in U.S. ( $R = 0.9107$ ,  $p \leq 5.402e-05$ )  
 sources: USDA:NASS; SEER

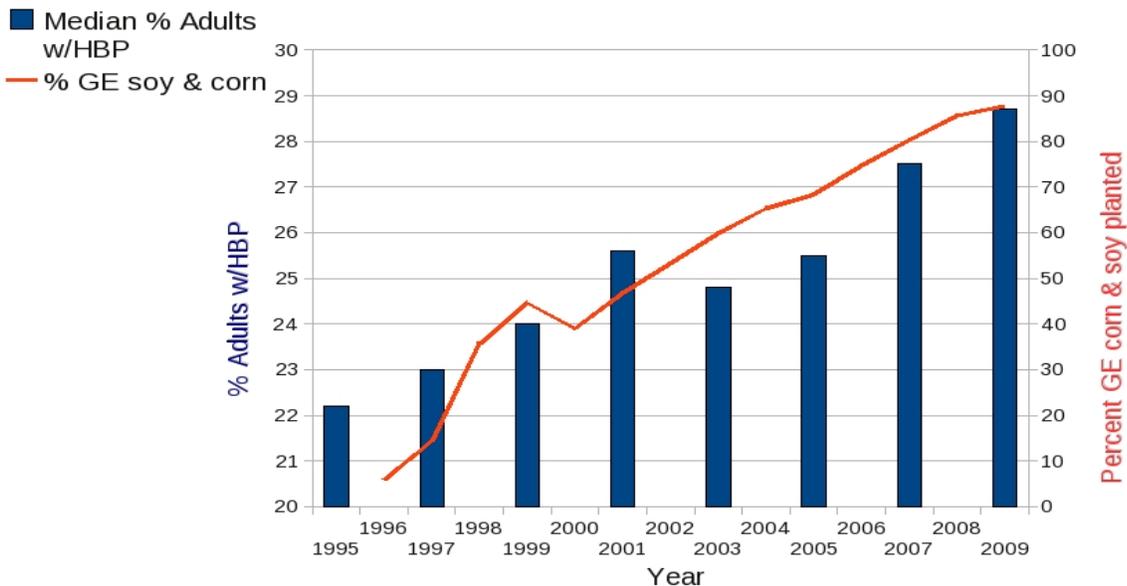


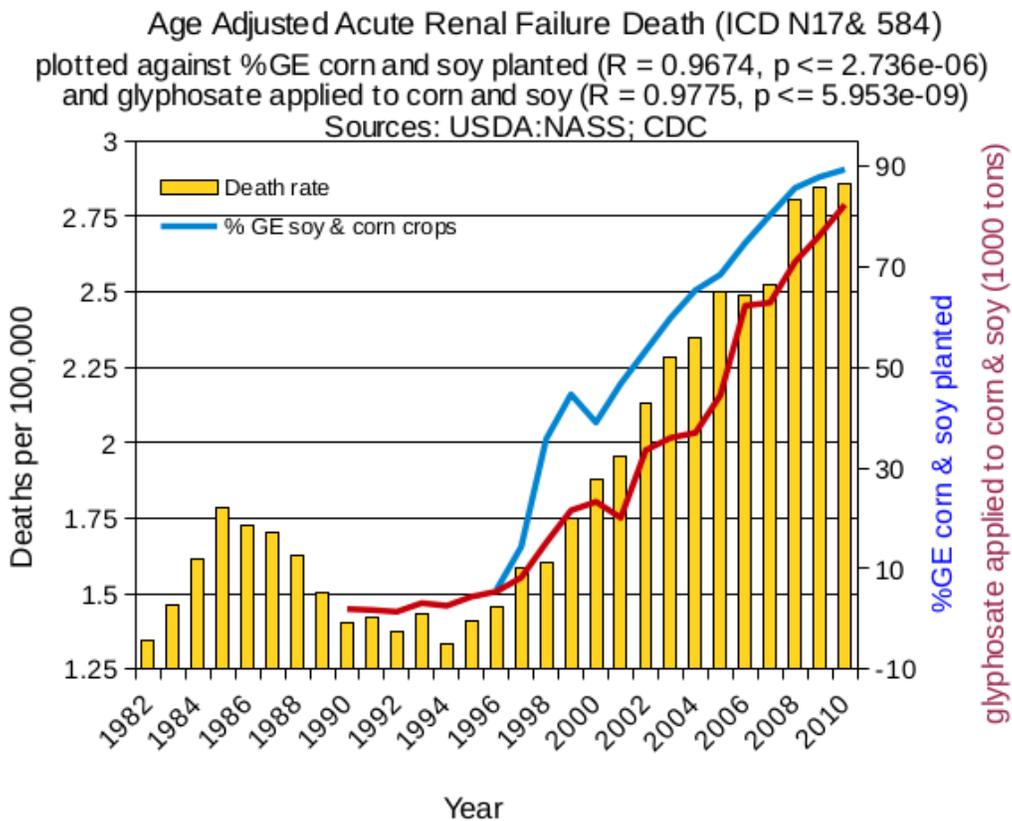
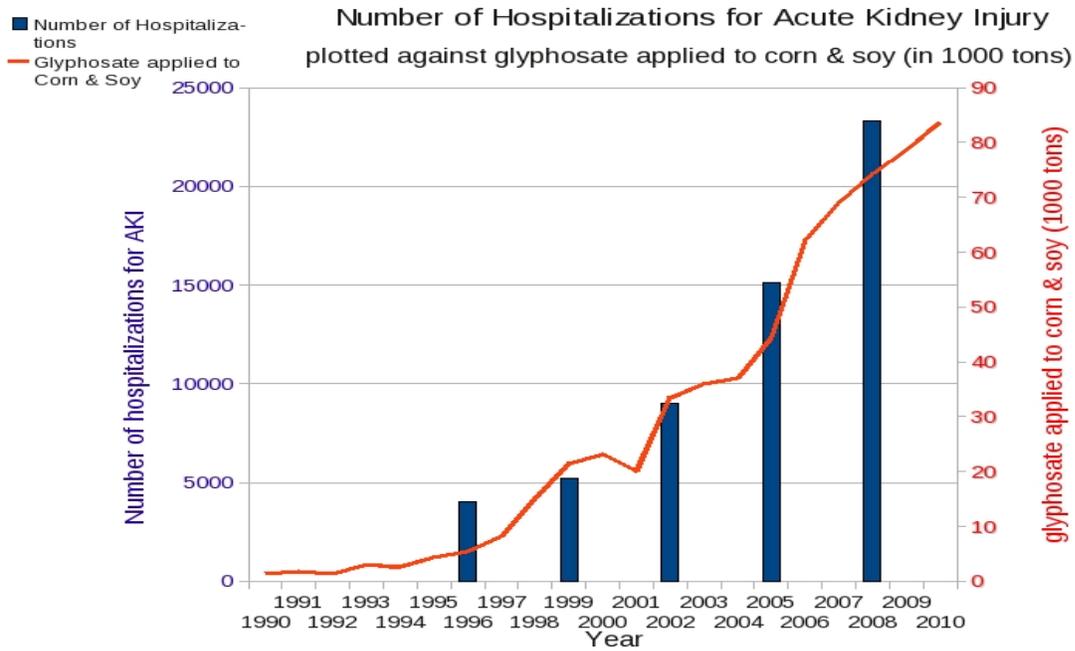
higher.”

The data for corn and soy crops have also been plotted against: % of U.S. population who are obese, who have high blood pressure, and hospitalizations for acute kidney injury (a sudden, temporary, and sometimes fatal loss of kidney function). While these data aren't available before 1995, the trends are remarkably coincident.



**Percent of Adults with High Blood Pressure in U.S.**  
 plotted against percent of GE soy & corn planted in U.S.

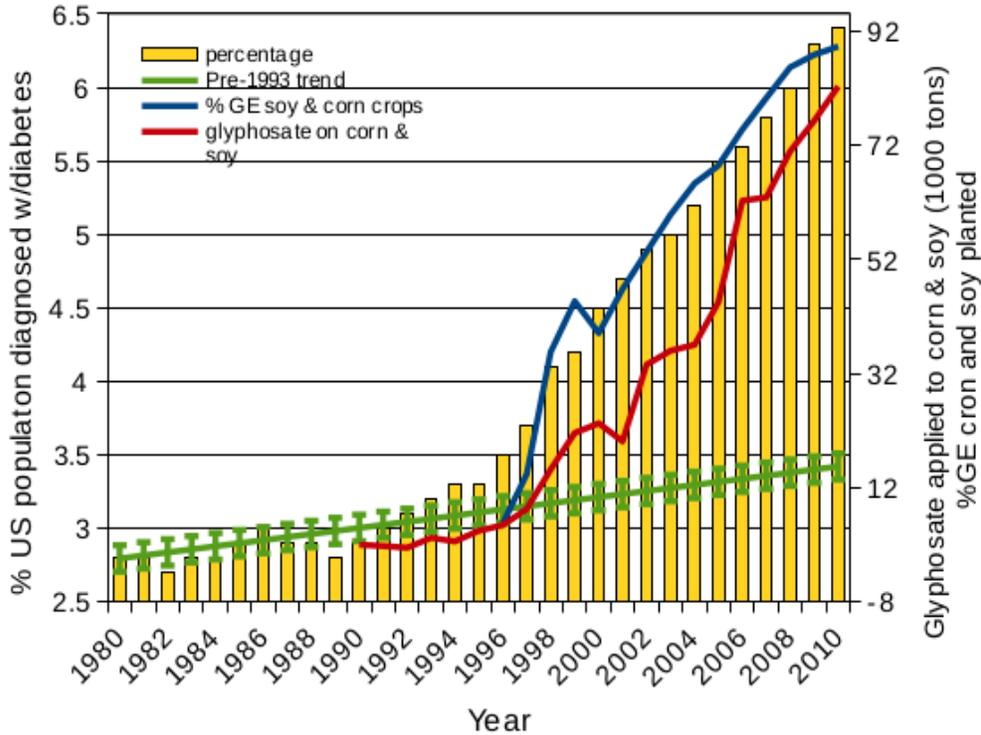




Finally the corn and soy crop data are plotted against the incidence and prevalence (number of people who have the disease) of diabetes. The correlation is clear. This is also in agreement with the S eralini study, “.. data confirmed very significant kidney chronic deficiencies; for all treatments and both sexes, 76% of the altered parameters were kidney related.”

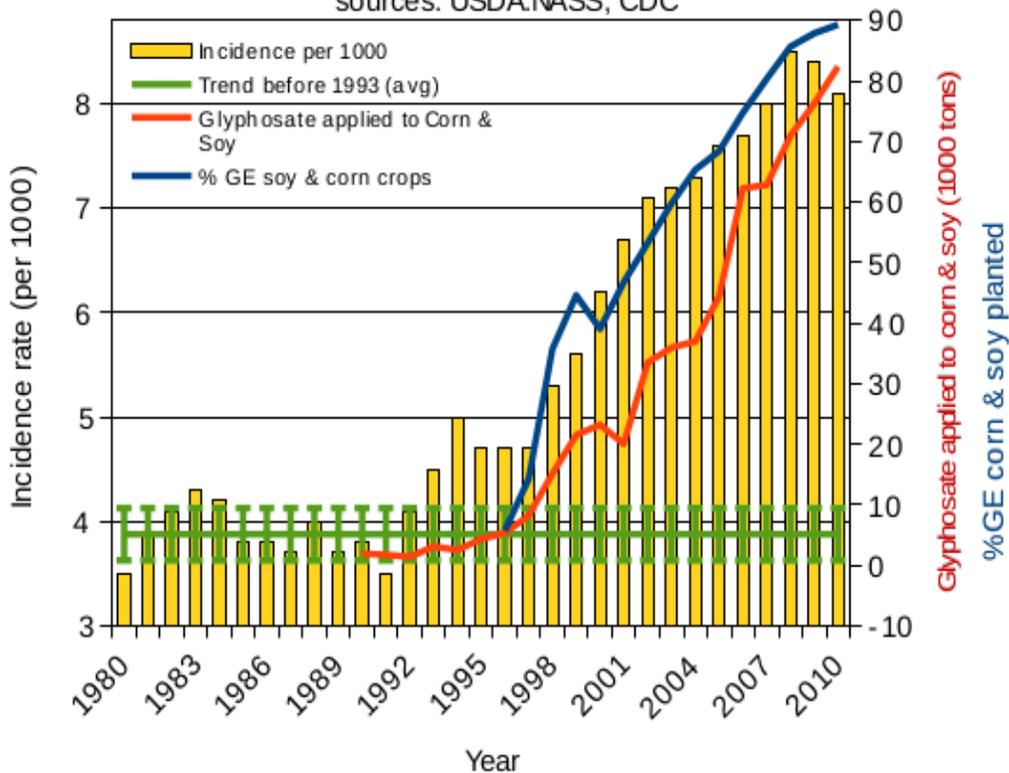
### Prevalence of Diabetes in US (age adjusted)

plotted against glyphosate applied to corn & soy ( $R = 0.971$ ,  $p \leq 9.24e-09$ )  
 along with %GE corn & soy grown in US ( $R=0.9826$ ,  $p \leq 5.169e-07$ )  
 sources: USDA:NASS; CDC



### Annual Incidence of Diabetes (age adjusted)

plotted against %GE corn & soy crops planted ( $R = 0.9547$ ,  $p \leq 1.978e-06$ )  
 along with glyphosate applied to corn & soy in US ( $R = 0.935$ ,  $p \leq 8.303e-08$ )  
 sources: USDA:NASS; CDC



Correlation does not necessarily imply cause and there may be other factors. Other known endocrine disruptors are: BPA (bisphenol-A) & phthalates (both in plastics), dioxins (byproduct of smelting, paper bleaching, manufacture of herbicides and pesticides), and atrazine polychlorinated biphenyls (PCBs -- used in electrical equipment, coatings, inks, adhesives, flame-retardants, and paints). Indeed, we are bombarded with a veritable cocktail of chemicals daily in addition to GMOs and their associated herbicides. These include food preservatives (BHA & BHT), water contaminants (chlorine & fluoride), food additives (aspartame, monosodium glutamate, carrageenan), and food coloring to name a few. We have been exposed to an increasing background level of chemicals for over 40 years. The body burden becomes overwhelming. GMOs may be pushing us off the cliff. Certainly more research should be done to firmly establish causality.

Acknowledgment: Jon Abrahamson helped with data mining for this article.

### Notes:

There are many scientific studies showing that glyphosate and the additives in Roundup are toxic to human cells. Below is a list of those most pertinent to this discussion.

In 2004, [Marc](#) et al. reported that glyphosate-based pesticides cause cell-cycle dysfunction that leads to development of cancer.

In 2009 [Gasnier](#) et al. published an article in the journal *Toxicology* citing evidence that glyphosate-based (G-based) herbicides are endocrine disruptors in human cells. They reported toxic effects to liver cells “at 5 ppm [parts per million], and the first endocrine disrupting actions at 0.5 ppm, which is 800 times lower than the level authorized in some food or feed (400 ppm, USEPA, 1998). ... In conclusion, according to these data and the literature, G-based herbicides present DNA damages ... on human cells.”

In 2012 [Koller](#) et al. reported that glyphosate and its formulation (Roundup) is toxic to cells, particularly organ cells, and exhibits DNA-damaging properties “after short exposure to concentrations that correspond to a 450-fold dilution of spraying used in agriculture.”

What is often overlooked is the role of “inert” ingredients in glyphosate formulations like Roundup, which have been found to amplify glyphosate toxicity.

In 2005, [Richard](#) et al. reported that “glyphosate is toxic to human placental JEG3 cells within 18 hr with concentrations lower than those found with agricultural use, and this effect increases with concentration and time or in the presence of Roundup adjuvants. Surprisingly, Roundup is always more toxic than its active ingredient. ... We conclude that endocrine and toxic effects of Roundup, not just glyphosate, can be observed in mammals.”

In 2012, [Mesnage](#) et al. reported, “This study demonstrates that all the glyphosate-based herbicides tested are more toxic than glyphosate alone ... The formulated herbicides (including Roundup) can affect all living cells, especially human cells. Among them, POE-15 clearly appears to be the most toxic principle against human cells, ... We demonstrate in addition that POE-15 induces necrosis when its first micellization process occurs, by contrast to glyphosate which is known to promote endocrine disrupting effects after entering cells.”

Data Sources:

Diabetes incidence data: [CDC](#)

Diabetes prevalence data: [CDC](#)

ESRD data: [U.S. Renal Data System](#)

Blood pressure data: [CDC](#)

Obesity data: [CDC](#)

Acute Kidney Injury: [National Kidney and Urologic Diseases Information Clearinghouse](#) (NKUDIC) a service of NIH (public domain).

Cancer data: [National Cancer Institute-Surveillance Epidemiology and End Results](#) (SEER)

SEER 9 areas (San Francisco, Connecticut, Detroit, Hawaii, Iowa, New Mexico, Seattle, Utah, and Atlanta).

Rates are per 100,000 and are age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130).

Glyphosate: [USDA:NASS](#) National Agricultural Statistics Service (NASS)

Percent GE corn & soy data:

1996-1999 data: [USDA Agricultural Economic Report No. \(AER-810\) 67 pp, May 2002](#)

2000-2012 data: [USDA:NASS National Agricultural Statistics Service](#)