Evidence of the safety of glyphosate[1] is non-existent. Evidence of the toxicity of glyphosate is overwhelming.

These facts are demonstrated by data that follow.

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[1] An ingredient found in agricultural material used in conjunction with growing genetically modified (GMO) crops

There are no safe levels of endocrine disruptors (Vandenberg et al., 2012; Bergman et al., 2013).

Imbalances and malfunctions of the endocrine system are known to lead to a host of disease conditions and disabilities:

> Imbalances and malfunctions of the endocrine system can lead to diabetes, hypertension, obesity, kidney disease, cancers of the breast, prostate, liver, brain, thyroid, non-Hodgkin's lymphoma (Marc et al., 2004; Thongprakaisang et al., 2013), osteoporosis, Cushing's syndrome, hypo- and hyperthyroidism, infertility, birth defects, erectile dysfunction, Soto & Sonnenschein, 2010), sexual development problems and neurological disorders such as: learning disabilities, attention deficit disorder (de Cock et al., 2012), autism (Schulkin, 2007), dementia (Ghosh, 2010), Alzheimer's (Merlo et al., 2010), Parkinson's and schizophrenia (MacSweeney et al., 1978);
>
> Endocrine disruptors are especially damaging to organisms undergoing hormonal changes: fetuses, babies, children, adolescents and the elderly (Bergman et al., 2013).

Glyphosate is a patented anti-microbial & biocide (U.S. patent number 20040077608 A1 and U.S. patent number 7771736 B2) that preferentially kills beneficial bacteria in our intestines leading to nutrient deficiency, chronic intestinal diseases, inflammation, and autoimmune diseases (Samsel & Seneff, 2013b; Kruger, 2013; Shehata et al., 2012; Carman et al., 2013).

Glyphosate has been shown to be toxic to the liver and kidneys (Cattani et al., 2014; Jayasumana et al., 2014; Lushchak et al., 2009; El-Shenawy, 2009; de Liz Oliveira Cavalli et al., 2013; Séralini et al., 2011).

Glyphosate and its degradation product, aminomethylphosphonic acid (AMPA) have been detected in the environment, in food, and in organs and tissue:

> Glyphosate and its degradation product, aminomethylphosphonic acid (AMPA) have been detected in air (Majewski et al., 2014, Chang et al., 2011), rain (Scribner et al., 2007; Majewski, 2014), groundwater (Scribner, 2007), surface water (Chang, 2011; Scribner, 2007; Coupe et al., 2012), soil (Scribner, 2007) and sea water (Mercurio et al.,2014), showing that glyphosate and AMPA persist in the soil and water and the amounts detected are increasing over time with increasing agricultural use;
>
> Glyphosate & AMPA residues are high in our food (residues as high as 15 parts per million have been detected in GM soybeans with no residues detected in organic or conventionally grown soy (Bohn et al., 2014);
>
> Glyphosate bioaccumulates in organs and tissue (Kruger et al, 2014).

The biological pathways between glyphosate and chronic disease have been

elucidated:

> The biological pathways between glyphosate and chronic disease have been outlined (Samsel & Seneff, 2013a).

There are compositional differences between GMO and Non-GMO crops (Bohn et al., 2014).

As of August, 2012, there had been a total of 144 GMO crops approved by the FDA. Of the 144 approved crops, 75% have been genetically engineered to either withstand direct applications of herbicides or they contain an insecticide Bt toxin, or both (Swanson, 2013).

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Evidence of the safety of glyphosate[1] is non-existent

Compiled by Adrienne Samuels, Ph.D.
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[1] An ingredient found in agricultural material used in conjunction with growing genetically modified (GMO) crops

The GMO-industry claim that GMOs and glyphosate are safe for human and animal consumption, are based on studies wherein researchers find no difference between reactions of people or animals that have ingested or come in contact with glyphosate or crops treated with glyphosate, and those who have not. While such information may prove to be interesting, it **proves** nothing about the safety of glyphosate or GMO crops treated with glyphosate. Finding no difference between two groups does not prove that there is no difference between them.

Review of the few industry-sponsored studies available for review will demonstrate that the inadequate numbers of subjects studied, the characteristics of those subjects (age and species, for example), and misuse of statistics used to analyze data, will have made it virtually impossible to come up with results that suggested that GMO's are anything other than safe. Another approach to concluding that a product is safe is to study the one or two things that the product is actually safe for, and from that limited study, have industry spin-artists conclude that the product is universally safe. Examples might be,

> 1) Duke SO, Lydon J, Koskinen WC, Moorman TB, Chaney RL, Hammerschmidt R.
>
> Glyphosate effects on plant mineral nutrition, crop rhizosphere microbiota, and plant disease in glyphosate-resistant crops.
>
> J Agric Food Chem. 2012 Oct 24;60(42):10375-97. doi: 10.1021/jf302436u. Epub 2012 Oct 15.
>
> (http://www.ncbi.nlm.nih.gov/pubmed/?term=23013354)
>
> 2) Edge CB, Gahl MK, Thompson DG, Houlahan JE.
>
> Laboratory and field exposure of two species of juvenile amphibians to a glyphosate-based herbicide and Batrachochytrium dendrobatidis.
>
> Sci Total Environ. 2013 Feb 1;444:145-52. doi: 10.1016/j.scitotenv.2012.11.045. Epub 2012 Dec 21.
>
> (http://www.ncbi.nlm.nih.gov/pubmed/?term=23262329%5Buid%5D)

Through careful reading of each industry-sponsored study, the reader will become aware that none meet the assumptions of the statistical tests used and cited, and on that basis alone, the conclusions drawn from each and every study are invalid.

Statisticians understand something that the general public does not. Statistical tests are nothing more than tools invented by men, who, in constructing each statistical test, have

made certain assumptions that have to be met if the tests are to be used appropriately. Using statistics, one cannot ***prove*** that there is no difference between two groups or conditions. Finding no difference between two groups or conditions may provide useful information for further study, but never provides ***proof***. In statistics, proof is demonstrated when data show that an experimental group (the group being exposed to GMO's, for example) is 95% or 99% more likely to suffer a toxic reaction than a control group (not exposed to the experimental substance).

The following examples illustrate the reasoning.

Example 1: Suppose it is known unequivocally from space missions that there is life on Mars, and that all Martians (group 1) have 2 heads. On Thursday an alien spacecraft lands in your back yard, and several aliens emerge (group 2). If the visiting aliens had three heads, we would know that the three-headed aliens were not from Mars, and that there must be life on other planets. (There is clearly a difference between the two groups of aliens.) However if the visiting aliens had two heads (just like the Martians), they might be from Mars, or they might come from another planet. Perhaps there are 2-headed aliens on another planet.

Example 2: Suppose that subjects are given purple dye number 12 or a placebo, and that the numbers of headaches reported by each group are the same. If reports of headache had been significantly greater in the group given purple dye, we could have concluded, with a certain amount of confidence, that purple dye caused headaches. But since reports of headaches were approximately the same for both groups, we would not know what to conclude. It might be that purple dye does not cause headaches. It might have been that subjects were eating something with purple dye in it during the studies, giving the placebo group headaches; or that purple dye only causes headaches in females and all of the subjects were males.

Drawing conclusions based on failure to find a difference is grossly inappropriate.[i,ii,iii] Given the assumptions underlying all statistical models, rigorous demonstration of the truth of the null hypothesis (that there is no difference between groups) is a logical impossibility.[i]

Failure to find a statistically significant difference between groups may provide useful information for planning one's next experiment, but it proves nothing. If you find something, then you find it. If you don't find something, it might be because it's hiding, because you don't look in the right place, because you are inept, or because someone paid you not to find it.

There is another fact that needs to be considered. You may be shown ***published*** studies produced by industry. But there may be countless other industry-sponsored studies wherein GMO's have been found to be toxic that are simply not published.

Then there are studies such as "Genetically Modified Soy Linked to Sterility, Infant Mortality," by Alexy Surov (2010) that were announced but never published (http://www.responsibletechnology.org/article-gmo-soy-linked-to-sterility).

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