

Antibiotic resistance is a serious and growing problem for human and animal health. New antibiotics are hard to find and can take decades to become available.

Further studies are now needed to see how glyphosate affects the gut microbiome in humans and to see if glyphosate at the actual doses ingested is a cause of antibiotic resistance in humans.

## Where Do Claims of “Safe” Glyphosate Levels Come From?

Industry and regulators have often claimed that harmful effects caused by glyphosate and Roundup in animal studies do not matter because the public is only exposed to “safe” levels that do not cause such effects.

Currently, regulators in the U.S. and Europe only set safety limits for exposure to glyphosate based on data from industry’s own toxicity studies on laboratory animals. The results of these industry tests, which are conveniently classified as commercial secrets and kept hidden from the public and the independent scientific community, are presented to expert panels in government or food safety agencies based in various countries or regions.

Unfortunately, the U.S. EPA and the European Food Safety Authority (EFSA) refuse to release the list of all the chemical ingredients used in the most common pesticide mixes, once again siding with industry lobbyists and hiding these toxic chemicals from the American public, all in the name of “trade secrets.”

## Reasons for Concern: Allowed Levels of Glyphosate Are Unlikely to be Safe

There are several reasons to doubt the validity of the current Acceptable Daily Intake (ADI) levels for glyphosate, including:

- The so-called safe levels of glyphosate exposure have never been tested directly to determine if indeed they are really safe to consume over the long term. Instead the “safe” levels are extrapolated from higher doses tested in industry studies.
- Industry toxicity study protocols are massively out of date. All toxicity tests conducted by industry for regulatory purposes are based on the old adage, “The dose makes the poison,” – that is, the higher the dose, the greater the

degree of toxicity. However, in some cases, low doses corresponding to human exposures can be more toxic than the higher doses tested in laboratory animals in industry studies. This is especially true for chemicals that disrupt the hormonal system (endocrine disruptors).<sup>56</sup>

- Safe levels of these endocrine disrupting chemicals cannot be extrapolated from effects at higher doses. Evidence from in vitro<sup>57</sup> and animal<sup>58</sup> experiments shows that glyphosate may be an endocrine disruptor at levels permitted in tap water in the EU and the U.S.
- Findings that glyphosate and its commercial formulations may be endocrine disruptors imply that the standard industry long-term animal studies are seriously inadequate.
- Hormones are vital regulators of fetal development. A subtle hormonal effect during early life can modify organ morphology and function for the rest of the life, as well as potentially leading to chronic diseases such as cancer and neurological and reproductive dysfunction in adults<sup>59</sup>.
- Even worse, the complete glyphosate herbicide formulations as sold and used contain additives (adjuvants), which are more harmful in their own right and/or increase the toxicity of glyphosate.<sup>60</sup> Safety limits are set for the isolated ingredient glyphosate, but the whole formulations, which can be generally more toxic, are never tested to determine long-term effects. This limitation of the regulatory process applies to all pesticides in all countries worldwide. Studies in rats confirm that the complete glyphosate herbicide formulations are toxic at levels deemed by regulators to be safe or have no adverse effect for the isolated ingredient glyphosate.<sup>61 62 63</sup> Other feeding studies in pigs<sup>64</sup> and rats<sup>65</sup> directly comparing the toxicity of formulations with glyphosate alone found that the formulations were far more toxic.
- Industry tests on glyphosate alone revealed toxic effects, notably birth defects<sup>66 67</sup>, below the levels that regulators claimed showed no toxic effect – but these results were ignored or dismissed by regulators in setting the supposedly safe ADI.<sup>68</sup>
- Independent studies have found toxic effects of glyphosate and its commercial formulations at environmentally realistic levels, which have never been tested by regulators. Effects include oxidative stress on liver and kidneys<sup>69</sup> and endocrine disrupting effects.<sup>70</sup>
- Glyphosate, which was claimed to be “as safe as table salt”<sup>71</sup> by Monsanto for over 40 years, was classified as a probable human



carcinogen by the World Health Organization in 2015. Glyphosate has never been tested during sensitive periods of life (such as fetal development) at environmentally relevant levels of exposure. In addition, the fact that Monsanto's commercial formulations have never been tested for regulatory purposes for more than one month in rats, and that without any blood testing, raises further doubt as to the validity of current ADI values.

These findings, taken as a whole, suggest that the levels of Roundup or glyphosate the American public are exposed to are not safe over the long term.

## What Have U.S. Food Safety Regulators Done to Protect Us?

### Obama Administration Raised Glyphosate Food Residue Levels at Monsanto's Request

Rather than call for increased oversight and monitoring of glyphosate in popular American foods, in 2013, the U.S. Environmental Protection Agency, under the direction of the Obama administration, actually increased the allowed tolerance pesticide exposure levels on glyphosate residues based on a petition to the agency submitted by Monsanto.<sup>72 73 74</sup>

These latest increases in glyphosate food residues in the U.S. raised allowable levels in oilseed crops, which include sesame, flax, and soybean, from 20 parts per million (ppm), to 40 ppm.

Under the Obama administration, the EPA also increased allowable glyphosate contamination levels for sweet potatoes and carrots from 0.2

ppm to 3 ppm for sweet potatoes and 5 ppm for carrots. That's 15 and 25 times the previous levels, respectively.<sup>75</sup>

An independent, peer-reviewed study conducted in 2014 on Roundup Ready soybeans found "extreme levels" of glyphosate residue in 7 out of the 10 GMO soy samples tested when compared to organic and conventionally raised soybeans.<sup>76 77</sup>

If these facts weren't troubling enough, recent testing commissioned by the Organic Consumers Association in coordination with The Detox Project at the University of California San Francisco (UCSF), found glyphosate in 93% of Americans tested at an average level of 3.096 parts per billion (ppb). Children had the highest levels with an average of 3.586 ppb.<sup>78 79</sup>

### Acceptable Daily Intake (ADI) or How Much Pesticide Residue You May Eat Every Day

Real concerns about glyphosate residue levels are growing in the U.S. and around the world, not only due to Monsanto's long-standing reputation for producing toxic chemicals that cause severe harm to human health and the environment, e.g. Agent Orange, DDT and PCBs, but also because of the persistence of glyphosate in food crops, which this study helps to confirm.

A 2014 study found that high levels of glyphosate exposure in animals and humans were correlated with an increase in chronic illness. The authors discovered that:

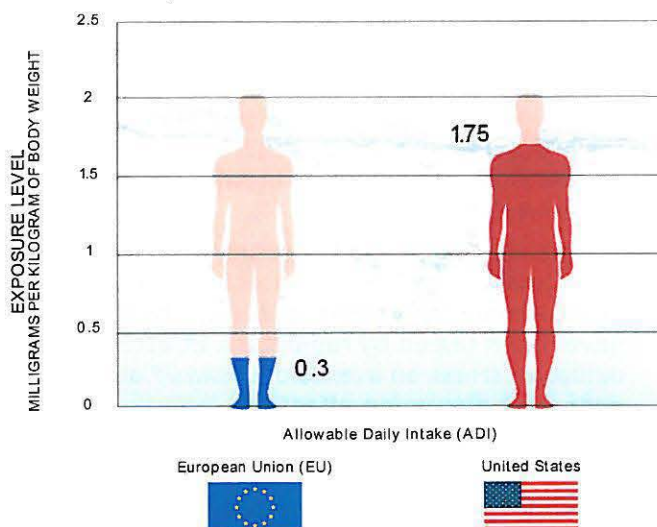
"Glyphosate residues in urine were grouped according to the human health status. Chronically ill humans had significantly higher glyphosate residues in urine than healthy humans."<sup>80</sup>

In order to limit threats to human health, federal regulatory agencies set limits on acceptable exposures based on a safety threshold, also called the Acceptable Daily Intake (ADI).<sup>81</sup> To assess whether or not an exposure is a health risk, the ADI or safety threshold for a given chemical is an estimate of the amount of a substance in food or drinking water, expressed on a body mass basis, that can be ingested daily over a lifetime by humans without appreciable health risks.

This calculation of Allowable Daily Intake for pesticide residues is based on the lowest dose considered non-toxic in animal feeding trials (i.e. 30mg/kg bw/d) sponsored by industry.

Accordingly, based on Monsanto's own private lab testing and consulting with scientists at different regulatory agencies around the world, the ADI value for glyphosate differs from country to country.

### U.S. Government Allows Nearly 6 Times More Glyphosate in Our Food than Europe





In Europe, the current ADI has been set at 0.3 mg per kg of bodyweight per day (written as 0.3 mg/kg bw/d),<sup>82</sup> while in the United States glyphosate's allowable daily intake is nearly 6 times higher at 1.75mg/kg bw/d.

These wide differences in allowable daily residue exposure mean that U.S. citizens are legally exposed to nearly 6 times the amount of glyphosate on a daily basis than individuals in Europe.

### Changes in Daily Exposure Based on Industry Science, at Monsanto's Request and a History of Scientific Fraud

In the case of glyphosate, this Acceptable Daily Intake level has been based on limited scientific studies presented to the EPA by glyphosate's original applicant for approval, Monsanto. As in Europe, the U.S. EPA has historically made these decisions based on corporate in-house scientific studies that have never gone through the peer review process, nor has any of the original data from these studies reported to regulatory agencies ever been made public.

More importantly, the differences in current Acceptable Daily Intake levels between the European Union and the U.S. are significant, do not represent the best or most current scientific data and are shrouded in controversy. This is not to say that this report endorses the European Union standard, which recent scientific evidence suggests establishes a tolerance too high to be guaranteed to safeguard human health.

### U.S. Acceptable Daily Intake for Glyphosate (ADI) Originally Set by EPA at 0.1 ppm

According to internal EPA documents, the original ADI set by the EPA toxicology division was 0.1 mg/kg/day in the early 1980s.<sup>83</sup> During this same period under the Reagan Administration, in 1985, the EPA classified glyphosate as a possible carcinogen, Class C, based on a long-term feeding study in which male mice fed glyphosate developed kidney tumors.<sup>84</sup>

The EPA initially defended this position, but Monsanto successfully submitted "historical control data" from multiple other unpublished studies and in a June 26, 1991 memo, the EPA reclassified glyphosate as Class E or "non-carcinogenic for humans" after much back-and-forth for several years with Monsanto scientists and lobbyists "based upon lack of convincing carcinogenicity evidence in adequate studies in two animal species."<sup>85</sup>

While Monsanto and other chemical manufacturers in the United States defend the low toxicity of Roundup and other glyphosate-based herbicides,

regulators in Europe took a more cautious scientific approach in setting the Acceptable Daily Intake limits for their citizens.

Rather than take Monsanto's approach on allowable levels, in its 1998 evaluation of glyphosate, Germany's Federal Office of Consumer Protection and Food Safety (BVL) determined that the allowable residue level should be set at 0.3 mg per kilogram of body weight, versus the high level of 1.75 ppm set by the EPA, or nearly 6 times higher than acceptable levels allowed in Europe based on industry feeding trials that they believed to be the most sensitive to the effects of the chemical.<sup>86</sup>

The decision-making process of the German government's Consumer Protection and Food Safety agency was spelled out in a public document that stated obvious concern over the high ADI chosen by their U.S. counterparts at the EPA. According to the BVL glyphosate review:

"A very high ADI of 1.75 mg/kg bw was proposed in the joint dossier of Monsanto and Cheminova and is based on the NOEL for maternal toxicity in a teratogenicity study in rabbits (Tasker, 1980). It is discussed here since it is far outside the range of all the other suggested values."<sup>87</sup>

The German review document details the then-current ADI level requests by various chemical manufacturers based on industry-approved studies made available to respective food safety agencies around the world in the 1990s. These original Acceptable Daily Intake levels range from 0.05 to 0.1mg/kg bw/day, 0.15 mg/kg bw/day and 0.3 mg/kg bw/day and the requested U.S. level of 1.75 mg/kg bw/day submitted by Monsanto and Danish pesticide maker Cheminova. (See original chart on page 16)

It's interesting to note that the U.S. ADI level of 1.75 mg/kg bw/day is 17.5 times the original ADI set by the EPA in the 1980s<sup>88</sup> and was obviously raised in anticipation of the approval of future GMO crops. Monsanto had already begun advance work on engineering genetically modified crops that were design to survive being sprayed with their proprietary flagship herbicide Roundup.

In their 1998 review of glyphosate, German regulators stated their objections to the EPA and Monsanto's ADI request in clear scientific terms:

"The acceptable daily intake should be based on the highest dose at which no adverse effect is observed in the most appropriate study in the most sensitive species. In the case of glyphosate, the different notifiers have proposed ADI values which cover a wide range between 0.05 and 1.75 mg/kg bw (see table B.5.10.2-1). This variance is due to the different studies used as



the respective basis for ADI calculation but may also result from a controversial evaluation of controversial studies.

A very high ADI of 1.75 mg/kg bw was proposed in the joint dossier of Monsanto and Cheminova and is based on the NOEL for maternal toxicity in a teratogenicity study in rabbits (Tasker, 1980). It is discussed here since it is far outside the range of all the other suggested values. This proposal was not accepted by the Rapporteur for the following reasons:

1. The NOEL for maternal toxicity in the respective study was established by the Rapporteur at 75 mg/kg bw/day instead of 175 mg/kg bw/day (see section B.5.6.2.2.2).
2. If a NOEL of 175 mg/kg /bw/day for the above mentioned rabbit study would have been accepted, one could identify some valid studies revealing adverse effects at lower doses. In a recent long-term study in rats (Suresh, 1996), effects occurred in female animals at a dietary dose level of 1000 ppm (ca 60/mg/bg bw/day). **The NOELs [No Observed Effect Level] and LOELs [Lowest Observed Effect Level] established in a further chronic rat study (Atkinson et al., 1993) and in two other rabbit teratogenicity studies (Suresh, 1993; Brooker et al., 1991) were well below 175 mg/kg bw/day.**

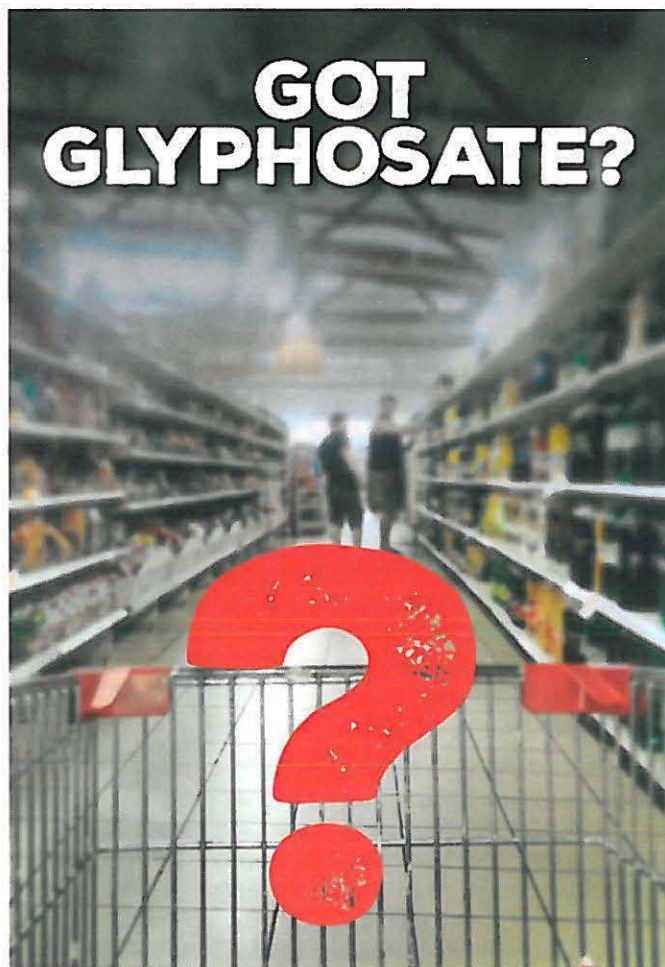
Usually, a chronic rat study is considered most appropriate to derive the ADI. Since the rat proved the most sensitive species upon long-term exposure, it is suggested to establish the ADI for glyphosate on the basis of the chronic toxicity data obtained in rats.<sup>89</sup>

### Current Scientific Research Calls for Much Lower Allowable Glyphosate Residues for Human Food Products

This spring, as regulators in the European Union attempted to re-register glyphosate for another 15 years, new independent scientific evidence was brought forward that called into question even the EUs more cautious 0.3 mg/kg bw/day allowable glyphosate residue level.

In the past 10 years alone, real scientific concern over the chemical's safety has only increased due to the widespread explosion in the use of Roundup and glyphosate-based herbicides in conjunction with industrial agriculture and further pressures on farmers to adopt GMO agriculture linked to herbicide tolerant traits.

In a study titled "*Transcriptome profile analysis reflects rat liver and kidney damage following chronic ultra-low dose Roundup exposure*," a team of international scientists performed a



transcriptome (gene expression) analysis of the liver and kidneys from rats fed an extremely low dose of Roundup. This resulted in a daily intake of glyphosate of only 4 nanograms per kilogram of bodyweight per day, which is 75,000 times below the EU acceptable daily intake (ADI equivalent) and 475,000 times below the US chronic reference dose (ADI equivalent). In other words, **a dose of Roundup that was far below what is permitted by regulators and believed to be safe to consume on a daily basis over the long term was found to damage the liver and kidneys of rats.** These results were statistically significant.<sup>90</sup>

While transcriptome analysis is highly predictive of disease status or organs, it cannot predict the corresponding disease states with absolute certainty, as not all changes in gene function result in changes in levels of the genes' protein products and metabolites. Such definitive proof has to be provided by additional molecular profiling analysis, namely proteomics (protein profile) and metabolomics (small molecule metabolite profile). The proteomics and metabolomics analyses give a direct measure of the organ's composition, so they are able to provide a direct indicator of the health or disease status of the organ in question.



**The authors concluded that long-term exposure to Roundup “at an ultra-low, environmental dose can result in liver and kidney damage with potential significant health implications for animal and human populations.”**

—MESNAGE ET AL, 2015

A separate study looked at the evidence for teratogenic effects (birth defects) in the industry studies submitted to regulators to gain market authorization for glyphosate. The authors reviewed

the German government’s original 1998 scientific analysis of allegedly safe daily glyphosate exposure levels and found that the government regulators had “introduced significant bias” into their review by intentionally excluding toxicity studies in rabbits that found harmful effects of glyphosate at much lower levels than their analysis admitted.<sup>91,92</sup>

Simply by reviewing the same studies that the German government regulators did in 1998, the authors calculated that the EU acceptable daily intake level of glyphosate was currently 3 times higher than it should be if all the industry studies had been rigorously evaluated.

By including in their analysis two independent peer-reviewed studies that had been completed since the EU set the acceptable daily intake for glyphosate residue in 2002, **the authors concluded that current ADI should be dramatically reduced to 0.025 mg/kg bodyweight per day or “12 times lower than the ADI proposed by the German regulators, which is currently in force in the EU and used as a basis for the maximum residue limit for food and feed.”**

**Multi-Generational Rat Studies on Glyphosate with Recommended ADI Levels**

Table B.5.10.2-1: Summary of ADI values proposed by the different notifiers and by the Rapporteur

Notifier	ADI (mg/kg bw)	Toxicological data on which this ADI proposal is based	Remarks of the Rapporteur
Monsanto/ Cheminova	1.75	Teratogenicity study in rabbits, NOEL: 175 mg/kg bw/d.	See discussion below.
Agrichem	0.1	3-generation study in rats, NOEL 10 mg/kg bw/d.	Based on published literature. Study not identified. Much higher NOELs have been established in more recent reproduction studies.
Alkaloida	0.06	12-month study in dogs, NOAEL: 300 ppm (5.79 - 14.62 mg/kg bw/d).	Supplementary study, NOAEL = highest dose tested.
Barclay	0.3	Chronic study in rats (NOEL 31 mg/kg bw/d) and 3-generation study in rats (NOEL 30 mg/kg bw/d) with reference to 1986 JMPR evaluation.	No original studies. In both cases, the NOELs were the highest doses tested. Both studies were considered supplementary only.
Feinchemie	0.05	Chronic study in rats, NOEL: 100 ppm (ca 5.5 mg/kg bw/d).	Interim report conclusion.
Herbex	-	Proposal for an ADI not submitted; appropriate studies not performed.	-
Luxan	0.15	Carcinogenicity study in mice (NOAEL 150 ppm, ca 15 mg/kg bw/d) and 3-generation study in rats (NOEL 300 ppm, ca 15 mg/kg bw/d).	Supplementary studies. In the reproduction study, NOEL = highest dose tested. Much higher NOELs have been established in more recent long-term and reproduction studies.
Nufarm	-	No toxicological data submitted.	-
Sanachem	0.3	Published literature.	It is assumed that this value refers to the JMPR evaluation in 1986 (i.e. ADI derived from a long-term rat study).
SCC/I.Pi.Ci.	-	Proposal for an ADI not submitted; appropriate studies not performed.	The company refers to the database of other notifiers.
Sinon (Shinung)	0.3	Published literature.	It is assumed that this value refers to the JMPR evaluation in 1986 (i.e. ADI derived from a long-term rat study).
Rapporteur	0.3	Summary of long-term studies in rats.	See discussion below.

Source: BVL, Germany. 1998. Monograph on Glyphosate.

Food Democracy Now! Glyphosate: Unsafe on Any Plate



## Monsanto and EPA Claim Roundup and Glyphosate Are Perfectly Safe: Science Says Otherwise

### Roundup Formula 125 Times More Toxic than Glyphosate Alone

For decades, Monsanto has publicly claimed that glyphosate was perfectly safe and the company's Roundup herbicide formulations are: "tough on plants, but no more toxic to people and animals than table salt" or "practically non-toxic."<sup>93</sup>

However, an increasing number of independent peer-reviewed studies have proven that glyphosate is not the most toxic ingredient in Monsanto's Roundup formulation.<sup>94 95</sup> Glyphosate is never applied to farmers' fields by itself. Instead, pesticide manufacturers create chemical formulations with added ingredients, called "inerts" or "adjuvants," that are needed to penetrate the plant's cell walls to deliver glyphosate into the plant's growth structure. There it works to block the synthesis of three aromatic amino acids essential for growth and makes the plant susceptible to disease and "soil borne fungal pathogens."<sup>96 97</sup>

According to an independent peer reviewed study published in the International Journal of Environmental Research and Public Health in 2014, scientists found that Roundup was 125 times more toxic than glyphosate alone:

"It is commonly believed that Roundup is among the safest pesticides. This idea is spread by manufacturers, mostly in the reviews they promote..., which are often cited in toxicological evaluations of glyphosate-based herbicides. However, Roundup was found in this experiment to be 125 times more toxic than glyphosate. Moreover, despite its reputation, Roundup was by far the most toxic among the herbicides and insecticides tested. This inconsistency between scientific fact and industrial claim may be attributed to huge economic interests, which have been found to falsify health risk assessments and delay health policy decisions."<sup>98</sup>

As a result of new and emerging research, several European countries have not only banned Roundup and glyphosate for use in public parks or sale for home gardens, but the German and French governmental health and safety agencies have forced pesticide manufacturers to remove at least one inert ingredient or "co-formulant" from Monsanto's Roundup Classic and Roundup Original formulas.<sup>99</sup>

For decades, the dangerous chemical known as polyethoxylated tallow amine (POEA), which is derived from animal fat, was a central ingredient in Monsanto's Roundup formula, making up to 15% of

the Roundup Original chemical mixture. As early as 2009 the prestigious Scientific American magazine reported that research scientists had found that:

POEA was more deadly to human embryonic, placental and umbilical cord cells than the herbicide itself – a finding the researchers call "astonishing."<sup>100</sup>

According to the 2009 study, published in Chemical Research in Toxicology, "Moreover, the proprietary mixtures available on the market could cause cell damage and even death [at the] residual levels" found on Roundup-treated crops, such as soybeans, alfalfa, corn, and lawns and gardens.<sup>101</sup>

Scientific American further reported concerns from a team of research scientists, who "suspects that Roundup might cause pregnancy problems by interfering with hormone production, possibly leading to abnormal fetal development, low birth weights or miscarriages."

Despite these concerns and the mounting scientific evidence of likely harm from Monsanto's Roundup formulas, regulators at the USDA and EPA have failed to incorporate this new research into their consideration of Roundup's potential toxicity.

## Glyphosate Bio-Accumulates in Major Organs and Bones

While Monsanto and U.S. regulatory agencies routinely claim that glyphosate is excreted quickly from the body, a number of studies in Europe have discovered higher levels of glyphosate residue found in cows raised in countries where GMO feed was allowed (Denmark) and significantly lower in areas considered "GM free" (Germany).<sup>102</sup>

Despite Monsanto's repeated claim that glyphosate does not bio-accumulate,<sup>103</sup> this 2014 study found glyphosate residues in multiple organs of slaughtered cows, including the intestine, liver, muscles, kidney and spleen, bringing into question Monsanto's claim that glyphosate is rapidly excreted and does not bio-accumulate in animals or humans.

Beyond accumulation in vital organs, glyphosate has also been found to accumulate in bones due to its strong chelating activity or ability to bind with calcium. According to the EPA's own internal documents, reporting on corporate-paid studies submitted by Monsanto, a significant portion of glyphosate is absorbed into the bones of mice and rats used in laboratory experiments.

In 1993, in the EPA's Reregistration Eligibility Decision (RED) on Glyphosate as reported by the Office of Prevention, Pesticides and Toxic Substances: "Less than 1.0% of the absorbed dose remained in tissues and organs, primarily in bone tissue."<sup>104</sup> The real question remains, what impact



does this steady accumulation in bone tissue have on human health?

In a study on humans and livestock, scientists found that “chronically ill humans had significantly higher glyphosate residues in urine than healthy humans” and also discovered that humans who ate conventional diets had much higher glyphosate residues than those who ate organic food.

According to the 2014 peer reviewed study published in the Journal of Environmental & Analytical Toxicology:

“Glyphosate was significantly higher in humans [fed] conventional [food] compared with predominantly organic [fed] humans. Also the glyphosate residues in urine were grouped according to the human health status. Chronically ill humans had significantly higher glyphosate residues in urine than healthy humans.”<sup>105</sup>

If these new findings weren't disturbing enough, a series of recent independent peer-reviewed studies found that low doses of Roundup or glyphosate-based herbicides were likely to damage the liver and kidneys of rats at ultra-low dose levels “in the range of what are now generally considered ‘safe’ for humans.”<sup>106</sup>

New scientific evidence of the harm from glyphosate continues to emerge at an almost dizzying pace, with concern in the scientific community linking Monsanto's most widely used weedkiller to endocrine disruption, disturbance of normal gut bacteria, autoimmune diseases, birth defects, reproductive problems, infertility and even potential antibiotic resistance.

New research is finding that some autoimmune and chronic inflammatory disorders such as rheumatoid arthritis are associated<sup>107</sup> in other studies with an increased risk of certain types of cancer, including non-Hodgkin's lymphoma, which was correlated with glyphosate exposure in the assessment by the World Health Organization's cancer agency IARC.<sup>108</sup> These findings raise the possibility that rheumatoid arthritis and non-Hodgkin's lymphoma share a common causative factor.<sup>109 110</sup>

For more than four decades, Monsanto has claimed that glyphosate did not bioaccumulate in animals or humans in any significant way, but a review of a 2004 joint report on pesticide residues in food by the United Nations Food and Agriculture Program and the World Health Organization determined that glyphosate does accumulate in the bones of lab animals.

“Analysis of individual tissues demonstrated that bone contained the highest concentration of [<sup>14</sup>C] glyphosate equivalents (0.3–31ppm). The remaining tissues contained glyphosate

equivalents at a concentration of between 0.0003 and 11ppm (Table 3). In the bone and some highly perfused tissues, levels were statistically higher in males than in females.”<sup>111</sup>

The question is, since non-Hodgkin's lymphoma is a cancer that starts in cells called lymphocytes, which are part of the body's immune system and can be found in bone marrow, what impact does this daily exposure to increasing levels of glyphosate residues have on the American public, which relies on a diet of processed foods, more than 75 percent of which contain genetically engineered ingredients that were sprayed with high levels of Roundup, Monsanto's flagship weedkiller?

Despite Monsanto's repeated claims of Roundup's safety, the company was successfully sued by the New York state's attorney general in 1996 over its use of “false and misleading advertising,” which forced the company to stop claiming its weedkiller was “biodegradable” and to halt ads that claimed Roundup was “safer than table salt” and “practically non-toxic.”<sup>112</sup>

A similar lawsuit was filed in France that resulted in a former chairman of Monsanto Agriculture France being “found guilty of false advertising for presenting Roundup as biodegradable and claiming that it left the soil clean after use” and a small fine for Monsanto's French distributor.<sup>113</sup>

## Peer-Reviewed Science on Glyphosate

There are many independent peer-reviewed studies that show the damage caused by glyphosate to human, animal and environmental health. Many of these studies can be found [here](#).

Some of the most important studies and reviews are summarized below:

### Cancer

- The teratogenic potential of the herbicide glyphosate-Roundup in Wistar rats. <https://www.ncbi.nlm.nih.gov/pubmed/12765238>
- Two long-term studies on rats indicating possible carcinogenic effects already existed at this time. These long-term studies on rats were conducted in 1979–1981 and 1988–1990. <http://www.inchem.org/documents/ehc/ehc/ehc159.htm>

### Human Epidemiological Studies Confirming Cancer Risk

Studies in human populations have found an association between Roundup exposure and two types of blood cancer:

- An epidemiological study of pesticide





applicators in the USA found that exposure to glyphosate herbicide was associated with higher incidence of multiple myeloma. <http://www.ncbi.nlm.nih.gov/pubmed/15626647>

- Epidemiological studies conducted in Sweden found that exposure to glyphosate herbicide was linked with a higher incidence of non-Hodgkin's lymphoma. <http://onlinelibrary.wiley.com/doi/10.1002/%28SICI%291097-0142%2819990315%2985:6<1353::AID-CNCR19>3.0.CO;2-1/full>
- A systematic review of the literature published in 2014 concluded that there was an association between exposure to glyphosate herbicides and non-Hodgkin's Lymphoma. <https://www.ncbi.nlm.nih.gov/pubmed/24762670>

### Endocrine Disruption (Hormone Hacking)

- Glyphosate herbicide was a potent EDC in rats, causing disturbances in reproductive development after exposure during puberty. <https://www.ncbi.nlm.nih.gov/pubmed/20012598>
- This new Argentine study is the first to show endocrine-disrupting effects of a glyphosate-based herbicide on the uterus of newborn and pre-pubertal rats, supporting the possibility

that glyphosate-based herbicides are endocrine disruptors. <http://www.sciencedirect.com/science/article/pii/S0300483X16300932>

- An in vivo study of Roundup administered to rats in drinking water diluted to 50 ng/L glyphosate equivalence – half of the level permitted in drinking water in the EU and 14,000 times lower than that permitted in drinking water in the USA – resulted in severe organ damage and a trend of increased incidence of mammary tumors in female animals over a 2-year period of exposure. The latter observation of tumors needs to be confirmed in an experiment with larger numbers of rats. <http://enveurope.springeropen.com/articles/10.1186/s12302-014-0014-5>

### Kidney and Liver Damage at Low Doses

- A ground-breaking peer-reviewed study published in Environmental Health Journal in 2015 shows the levels of glyphosate-based herbicides which the general public are commonly exposed to in drinking water, altered the gene function of over 4000 genes in the livers and kidneys of rats. <http://ehjournal.biomedcentral.com/articles/10.1186/s12940-015-0056-1>



## Binding of Vital Nutrients

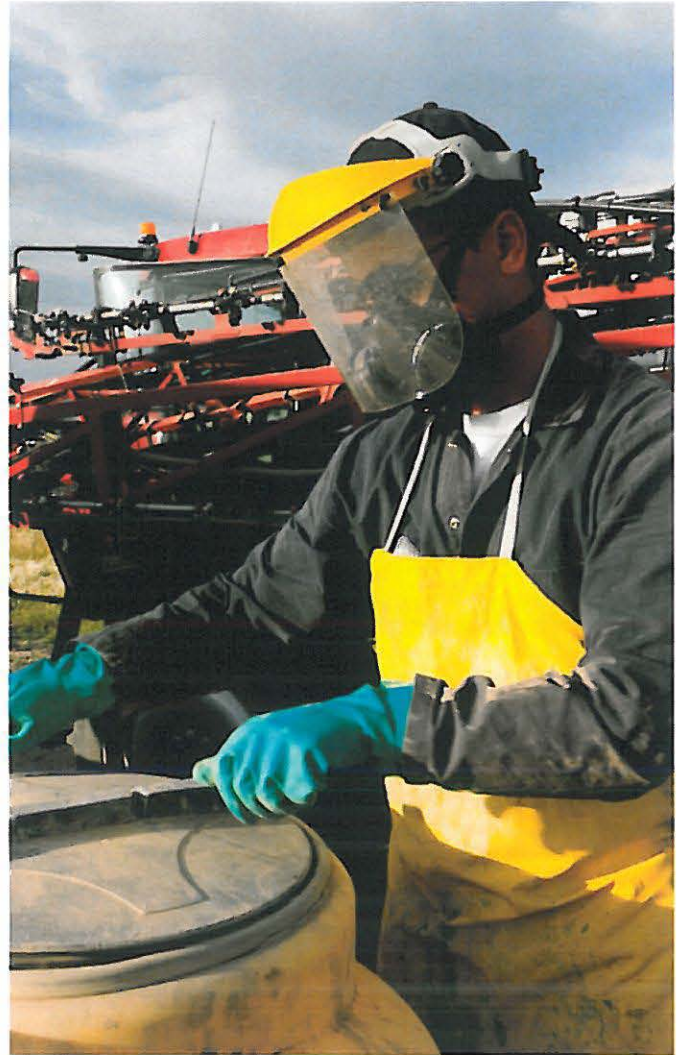
- Glyphosate binds (chelates) vital nutrients such as iron, manganese, zinc, and boron in the soil, preventing plants from taking them up. <https://core.ac.uk/download/pdf/11741277.pdf?repositoryId=393>
- Genetically Modified (GM) soy plants treated with glyphosate have lower levels of essential nutrients and reduced growth, compared with GMO and non-GMO soy controls not treated with glyphosate. <http://link.springer.com/article/10.1007%2Fs11104-009-0081-3>

## Antibiotic Resistance

- Research lead by a team from the University of Canterbury, New Zealand found that commonly used herbicides, including Roundup, can cause bacteria to become resistant to antibiotics. <http://mbio.asm.org/content/6/2/e00009-15>

## For Reference: Allowed Levels of Glyphosate in Drinking Water

- Council of the European Union. Council directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption. Off J Eur Communities. 1998. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:330:0032:0054:EN:PDF>
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## Glyphosate Exposure Levels in Humans: Healthy and Chronically Diseased

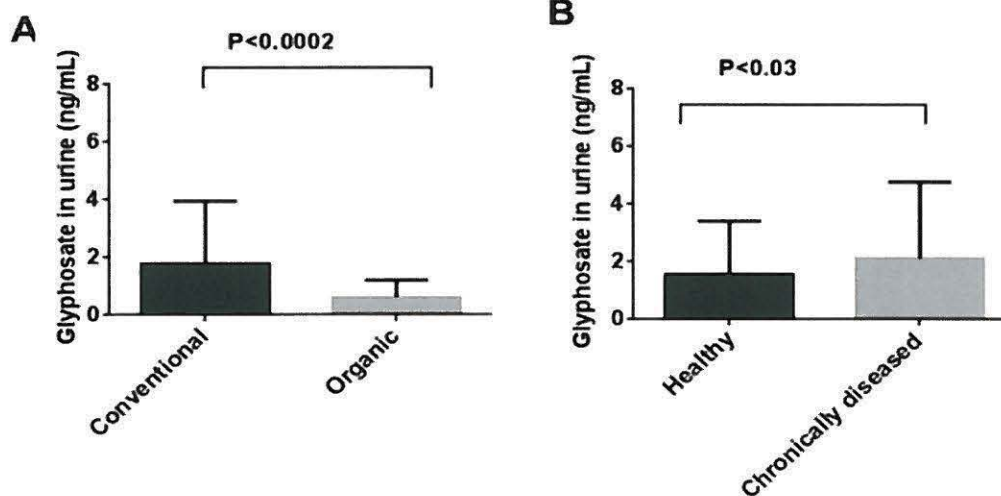


Figure 3: Glyphosate in humans. A) Comparison of glyphosate excretion with urine of humans with conventional (N=99) and predominantly organic (N=41) feeding. B) Glyphosate in healthy (N=102) and chronically (N=199) diseased humans.

Source: Krüger M, 2014.





## How to Avoid Glyphosate

After reading this report, which confirms glyphosate contamination in our food supply, as well as findings of glyphosate in drinking water, rain and the air, the first question you might ask yourself, is how can I avoid unwanted glyphosate residues in my, or my family's, daily meals?

The results presented in this report are the first round of independent testing of common American food products. This report uses the regulatory recognized "gold standard" testing methods of an FDA registered laboratory. While we are alarmed at the results found in a wide range of popularly consumed foods, we simply cannot say with certainty what levels of glyphosate residue are actually in the food supply.

These unprecedented pesticide residue tests confirm that glyphosate contamination is widespread. Not only do high levels of glyphosate residues show up in obvious GMO products, but they are also present in foods that are not genetically engineered. Glyphosate residues are now found in food crops, such as wheat, oats and barley, where glyphosate is used as a pre-harvest drying agent.

### High Glyphosate Levels as a Result of Pre-Harvest Spraying of Roundup

In this initial round of testing, the two highest glyphosate residue levels were found on products that intentionally do not contain GMO ingredients and proudly boast their Non-GMO status on the packaging.

In the case of Cheerios, General Mills removed GMOs from their iconic cereal in 2014 and now market

the popular cereal as "Not made with genetically engineered ingredients" and also "gluten free." Unfortunately, the practice of pre-harvest spraying of Roundup on Cheerios number one ingredient "whole grain oats," has resulted in the highest levels of glyphosate contamination, which poses health concerns for young children consuming this food on a daily basis.

The next highest level was found in Stacy's Simply Naked Pita Chips, which contain no GMO ingredients and are actually certified by a third party, the Non-GMO Project, which test for GMO contamination levels, but not pesticide residues.

This report reveals that glyphosate use is widespread and moves freely in the environment. Even the two organic products that were tested as controls found glyphosate contamination. Obviously more testing is needed.

### An Organic Diet for 1 Week Reduces Pesticide Exposures by 90%

Since GMOs and Roundup are both prohibited from organic production, the simplest way to avoid glyphosate contamination in food and to reduce exposures to synthetic pesticides is to eat organic food.

A 2014 study published in the Journal of Environmental Research confirmed that families eating an organic diet for as little as a week removed more than 90% of the pesticides from their system, as detected through urine tests.<sup>14</sup> According to this independent study, "the average person is exposed to 10 to 13 pesticide residues each day from food, beverages and drinking water."



## Call to Action:

Based on these scientific findings, Food Democracy Now! is calling for:

1. A federal investigation into the likely harmful effects of glyphosate on human health and the environment as a result of these disturbingly high levels of glyphosate residues found in popular American food products.
2. The EPA to refuse to reapprove glyphosate until the most current scientific evidence can be reviewed in an open and transparent process.
3. A permanent ban on the use of glyphosate as a pre-harvest drying agent for crops such as dry beans, sunflowers, wheat, oats and barley.
4. The immediate release of all restricted, allegedly "trade secret" data from all previous industry studies on glyphosate and glyphosate-based herbicides by the relevant federal agencies, including the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA).

### Demand Immediate Release of Industry Science Data; End Pre-Harvest Spraying on Wheat, Oats, Barley and other Food Crops!

Today FOOD DEMOCRACY NOW! is calling for an immediate release by the EPA, FDA and USDA of all the data from corporate controlled scientific studies. Monsanto and other pesticide manufacturers are legally allowed to keep this information from the public and scientific community at large, based on the notion of "trade secrets," which since glyphosate's original patent expired is no longer a valid justification.

This lack of scientific integrity is alarming. Hiding fundamental research data from the public and the scientific community is a threat to public health. It undermines trust in the safety of our food supply, our federal government and the regulatory agencies that are supposed to be looking out for the wellbeing of the American public.

### Urgent Need for Fundamental Reforms of Scientific Review Process

U.S. and European regulators and the chemical companies that supply them with corporate-sponsored research may try to dismiss these findings. However, a growing body of new independent, peer-reviewed scientific research continues to show disturbing evidence of harm from Roundup and glyphosate, at what were previously considered safe or extremely low doses. The evidence shows that Roundup and glyphosate are

far more toxic than was generally believed during the original scientific reviews of glyphosate's safety in the 1970s and 1980s.

Since that time, new scientific understandings of the real harm that chemicals can cause at low levels, such as the toxic effects of endocrine disruption, has emerged and must be considered in any new review of Roundup and glyphosate re-authorizations.



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Food Democracy Now! is a grassroots movement of more than 650,000 farmers and citizens dedicated to building a sustainable food system that protects our natural environment, sustains farmers and nourishes families.

We know we can build a food system that gives our communities equal access to healthy food, and respects the dignity of the farmers who produce it. We believe in recreating regional food systems, supporting the growth of humane, natural and organic farms, and protecting the environment. We value our children's health, worker's rights, conservation, and animal welfare over corporate profits. We believe that working together, we can make this vision a reality in our lifetimes.

The Detox Project:  
[www.detoxproject.org](http://www.detoxproject.org)

The Detox Project is a research platform that brings awareness to the public by testing for man-made chemicals in our bodies and in our food at a very personal level.

We believe you have the right to know what man-made chemicals are in your body and in your food!





## About the Authors

### David Murphy

Dave is the founder and executive director of Food Democracy Now!, a grassroots movement of more than 650,000 American farmers and citizens dedicated to reforming policies relating to food, agriculture and the environment.

In 2006, Murphy moved back to Iowa to help stop a factory farm from being built near his sister's farm. After seeing the loss of basic democratic rights of rural Iowans, Murphy decided to stay in Iowa to fight for Iowa's farmers and rural residents and expose the laws of industrial agriculture to help create a more sustainable future for all Americans.

In 2012, Murphy served as the co-chair of California's Prop 37, a ballot initiative to label genetically engineered foods. Following a narrow loss, Murphy helped write and pass the first two GMO labeling bills in Connecticut and Maine in 2013. His writing has appeared in The Nation, The Hill, The Huffington Post and The New York Times.

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### Henry Rowlands

Henry was brought up on a family run organic sheep farm in the Pembrokeshire National Park in Wales. His connection to both farming and the protection of the Welsh countryside led to a deep interest in issues related to sustainable agriculture from a young age.

Following work as a Journalist in many countries across Europe, Henry moved on to set up one of the World's most successful Sustainable Agriculture online news sources "Sustainable Pulse" which focuses on GMOs and pesticides. Sustainable Pulse now has a regular readership of over 100,000 people per month from over 125 countries.

Sustainable Pulse is also involved in a number of reference projects, all of which have the aim of educating the public on the problems surrounding the overuse of pesticides. These include The Detox Project, which has set up a unique pesticide testing platform across America.



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