Friends of the Earth Europe

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Human contamination by glyphosate

Friends of the Earth Europe, June, 2013

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Introduction

Glyphosate is the world's best-selling chemical herbicide. Glyphosate-containing herbicides, such as Monsanto's Roundup, are the most widely used herbicides in Europe and are applied in farming, forestry, parks, public spaces and gardens. Glyphosate-containing herbicides are also crucial to the production of genetically modified herbicide resistant crops. In recent years a number of scientific studies have raised concerns about glyphosate's safety and there have been calls for glyphosate-containing herbicides to be banned. New research by Friends of the Earth has detected glyphosate residues in the urine of 44 percent of people tested, from 18 different European countries.

Glyphosate in food

Glyphosate-containing herbicides are applied in large amounts to both genetically modified (GM) crops and non-GM crops. GM crops may receive two or three applications of glyphosate in a season [1] while glyphosate-containing herbicides may be sprayed just before harvest onto non-GM cereals, pulses, sunflowers and oilseed crops. This is done to remove weeds and dry out the grains, a process called 'dessication' [2]. Glyphosate remains largely unchanged in non-GM plants, but GM plants will convert glyphosate into aminomethyl phosphonic acid (AMPA), N-acetyl-glyphosate or N-acetyl-AMPA, depending on the type of genetic modification used [3]. When conducting risk assessments of residues in food, the European Food Safety Authority views such breakdown products as equivalent to glyphosate [4].

Once applied, glyphosate and its break down products are transported throughout the plant into the leaves, grains or fruit [5]. They cannot be removed by washing, and they are not broken down by cooking [6]. Glyphosate residues can remain stable in foods for a year or more, even if the foods are frozen, dried or processed [7]. Some processing may even concentrate the residues; for example, during production of wheat bran the glyphosate residues may be concentrated by a factor of four [8].

Industry studies show that when livestock are fed glyphosate at levels allowed in feed, glyphosate residues may be present at low levels in milk and eggs from the animals, as well as in the liver and kidneys [9]. In fact, the European Food Safety Authority is planning to examine the issue of glyphosate residues in animal products, because *"[c]onsidering the wide use of glyphosate on feed crops, a significant livestock exposure to glyphosate and its metabolites might be expected, resulting in a carry-over of residues in the food of animal origin*." [10]

'Acceptable Daily Intake'

In 2002, EU authorities set an 'acceptable daily intake' (ADI) for everyday exposure to glyphosate, of 0.3 mg glyphosate per kilo of bodyweight per day. This means, for example, that an 'acceptable' consumption of glyphosate residues for a child weighing 20kg would be 6 mg every day. The Food and Agriculture Organisation has set an even higher ADI, of 1 mg/kg/day, meaning it would be 'acceptable' for a 20 kg child to eat 20 mg of glyphosate every day. But concerns have been raised about these high limits. A group of independent scientists recently suggested the ADI should be set much lower, at 0.025mg/kg, based on research published in scientific journals since 2002 [11].

The 'Maximum Residue Level'

The 'maximum residue level' (MRL) is the legal limit for pesticide residues in foods and animal feed. Limits are set for each pesticide in different foods. When setting MRLs, the authorities must ensure that the 'acceptable daily intake' will not be exceeded, but because the ADI for glyphosate has been set so high, the MRL in different foods can also be set at a very high levels. For example, the European MRL for wheat and peas is 10mg/kg, meaning a kilogram of wheat can contain up to 10 mg of glyphosate [12]. As a comparison, the typical Vitamin E content of wheat is 7-10mg/kg [13]. The MRL for glyphosate in soya, oats and barley is even higher, at 20 mg/kg, while for wild fungi it is 50 mg/kg.

Over time, the permitted limit for glyphosate in many staple food crops has been going up. In the last two decades, the Codex Alimentarius Commission, which sets international MRLs, has raised the MRL for glyphosate across a range of crops, in some cases more than once; some examples are shown in table 1. European limits can be higher or lower than international levels.

Year ADI was set for each food/feed	Crop	Increase of international MRL (from – to)	(multiple)
1997 [14]	Soybeans	5 - 20mg/kg	(x4)
	Soybean fodder	20 - 200mg/kg	(x10)
1999 [15]	Cotton seed	0.5 - 10 mg/kg	(x20)
	Maize grain	0.1 - 1 mg/kg	(x10)
	sorghum	0.1 - 20 mg/kg	(x200)
2006 [16]	Cotton seed	10 - 40 mg/kg	(x4)
	(EU MRL remains 10 mg/kg)		
	Maize grain	1 - 5 mg kg	(x5)
	(EU MRL remains 1 mg/kg)		
	Barley straw and fodder	None - 400 mg/kg	
	Grass hay	50 - 500 mg/kg	(x10)
2012 [17]	Lentils	0.1 - 5 mg/kg	(x50)
	(EU MRL increased to 10 mg/kg)		
	Sweetcorn	0.1- 3 mg/kg	(x 30)
	Sugar beet	1 - 20 mg/kg	(x20)

According to the German government, *"[c]hanges to maximum glyphosate residue levels are usually based on changes in agriculture*" [18]. In other words, the expanded or increased use of glyphosate-containing herbicides, for example due to the introduction of GM glyphosate tolerant crops, will lead to an increase in the maximum residue level. In addition, increases may be trade-related. In 2012, at the request of Monsanto, the European Commission raised the EU's MRL for glyphosate in lentils to 10mg/kg, above the international limit [19]. This was to allow the import of glyphosate-treated lentils from Canada and the United States.

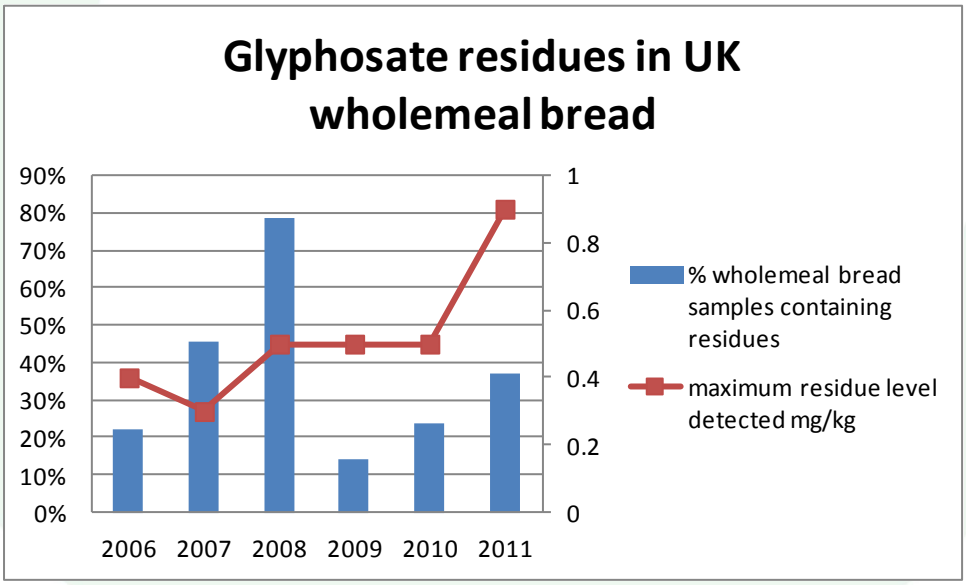
The 'maximum residue level' reflects the needs of industrial agriculture and trade, and it tends to go up. In turn, rising limits allow farmers to use more glyphosate-containing

herbicides on a range of crops, so it seems likely that people are being exposed to ever more glyphosate in their food.

Monitoring for glyphosate residues in food

Despite glyphosate's global dominance as a herbicide, there is little testing of glyphosate residues in food. In 2009 European Union authorities conducted 186,852 tests on cereal samples for pesticide residues. But only five countries tested for glyphosate [20], amounting to 462 samples of which 42 tested positive. In fact, EU authorities only agreed to begin regular monitoring of glyphosate in cereals from 2010, and there is no testing at all of glyphosate residues on imported GM soybeans [21]. Glyphosate testing does not appear to be prioritised; even in the European Union only a small number of testing laboratories have the facilities to detect the chemical [22]. The lack of data means it is difficult to find out how much glyphosate people are being exposed to in their food.

The UK government does test for glyphosate residues in bread. Their results show that contamination is common [23], particularly in wholemeal bread.



Separate testing of wheat bran found residues of up to 5.7mg/kg [24] and a study in Germany found glyphosate residues in barley of up to 23 mg/kg [25]. The UK government has issued advice to farmers on how to reduce glyphosate residues in wheat crops [26], and leading bakeries in Denmark no longer accept glyphosate treated grain [27].

Detection of glyphosate residues in humans

As with food, there has been little investigation of glyphosate contamination in humans. Industry-funded studies have suggested almost all glyphosate is excreted from the body within a week [28]. However, given its widespread use, people could be having frequent, or even continuous, exposure to glyphosate in their food. A few studies have looked for glyphosate in humans. An industry-funded study measured glyphosate in the urine of US farmers, and their families, after application of the herbicide to their crops [29]. One the day of application, 60% of the farmers had detectable glyphosate in their urine, ranging from <1 to 233 ng/ml (parts per billion, ppb). Urine samples were taken for another 3 days, by which time glyphosate was detectable in 27% of samples, with the level ranging from <1 to 68 ng/ml (ppb).

Research by a university in Canada found glyphosate in 5% of blood samples taken from women undergoing surgery, up to the level of 93.6 ng/ml (ppb) [30], although it was not found in blood samples from pregnant women. An independent study in Iowa tested glyphosate concentrations in the urine of farming and non-farming families. Glyphosate was detected in the majority of samples, including more than 80% of the children's urine samples [31]. For mothers and children there were no statistically significant differences between the farming and non-farming families, suggesting they were being exposed to similar levels of glyphosate [32].

Friends of the Earth results

On average 44 per cent of all samples from volunteers in 18 countries were found to contain traces of glyphosate. All volunteers who gave samples live in cities, and none had handled or used glyphosate products in the run up to the tests. The evidence suggests that a significant proportion of the population could have glyphosate in their bodies – and it is not clear where it is coming from.

Glyphosate frequency of detection in the participating countries:

Malta (90 percent), Great Britain, Germany and Poland (70 percent each), Netherlands (63 percent), Czech Republic (60 percent), Belgium and Latvia (55 percent each), Cyprus (50 percent), Spain and Croatia (40 percent each), Hungary and France (30 percent each), Austria and Georgia (20 percent each), Switzerland (17 percent), Bulgaria and Macedonia (10 percent each).

Conclusions and demands

New research from Friends of the Earth has shown that people from all over Europe – in EU and none EU countries – have glyphosate residues in their urine. The evidence suggests that a significant proportion of the population could have glyphosate in their bodies – and it is not clear where it is coming from. Despite the fact that glyphosate is the world´s best-selling chemical herbicide and glyphosate-containing herbicides are the most widely-used herbicides in Europe, very little testing is done for glyphosate residues in food, feed, or water. Tests for glyphosate in the body do not take place at all.

Friends of the Earth wants to know:

- Why do people have glyphosate in their urine? Where does it come from?
- Why haven´t public authorities done any testing on glyphosate residues in humans?
- Why is food, animal feeds (such as imported soy) and drinking water so rarely tested for glyphosate?
- What are the health impacts of glyphosate in our bodies? Is it guaranteed that glyphosate residues are completely excreted? If not, what happens to the remaining residues?
- Why haven´t there been any long-term health studies on on-going glyphosate uptake in humans?
- Why have the maximum residue levels (MRLs) for glyphosate in food and feed been steadily increased?
- Who is profiting from increasing glyphosate use?
- Why are authorities considering applications to grow glyphosate-resistant genetically modified crops in Europe?

Given the uncertainty about how glyphosate is entering people and the need to minimise exposure to glyphosate, Friends of the Earth demands that:

- The EU and national governments must immediately start a monitoring programme for glyphosate in food and feed, including imported animal feed crops such as GM soy. Levels of glyphosate (and its breakdown product AMPA) in the environment should also be monitored, covering aquatic systems and soil. These monitoring programmes should be comprehensive and the results should be made available to the public without delay.
- National governments must introduce a glyphosate reduction programme and desiccation (spraying crops shortly before the harvest) should be banned without delay. All other uses for glyphosate should be evaluated by 2015, existing maximum residue limits (MRLs) should be re-evaluated, and there must be no further increases in the MRLs.
- No glyphosate resistant genetically modified crops should be authorized in the EU.
- All food processors and retailers should minimise their customer´s exposure to glyphosate residues by specifying glyphosate-free products from their suppliers. They should extend their internal pesticides monitoring programme and include glyphosate in their regular testing.

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