

Roundup – Is it safe?

Summary briefing

July 2009

This briefing is a summary* looking at new research suggesting that the weed killer Roundup as sold to farmers and gardeners and used on GM crops is more toxic than Monsanto and pesticide regulators say it is.

Background

Roundup is manufactured by Monsanto and is based on a chemical called glyphosate, which disrupts many processes in plant cells causing their death. Roundup is taken up by plants and transported to all parts, so it kills the whole plant. Monsanto rely heavily on global sales of Roundup for their profits. To ensure sales continued to rise when their patent on glyphosate ran out in 2000, the company produced glyphosate-tolerant crops (known as Roundup Ready, or RR) by genetically engineering a bacterium gene into crops such as soya, maize and oilseed rape. RR crops can withstand being sprayed with Roundup, but all the other plants in the field die, leaving the crop free of weeds. RR crops have been taken up in North and South America (especially RR soya), and as a result Roundup sales have soared, and with them Monsanto's profits.

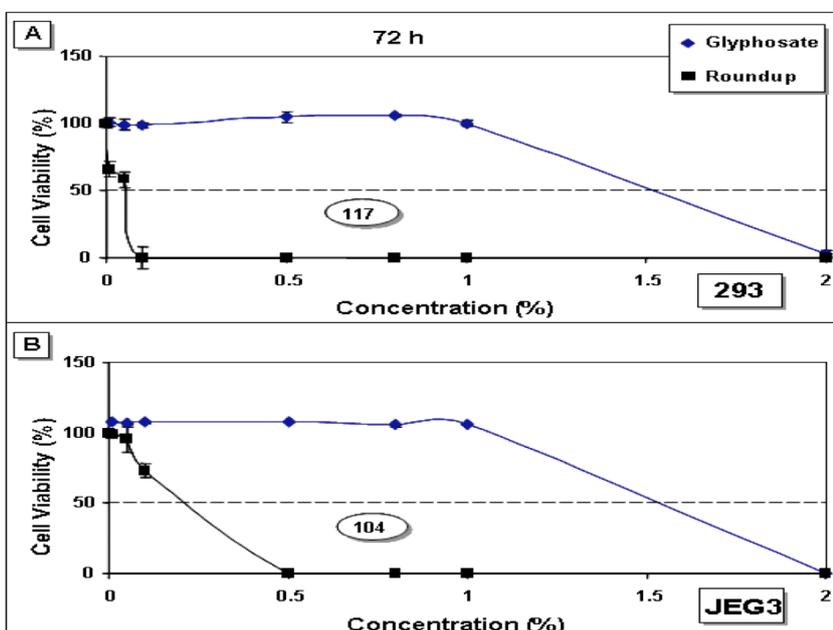
Roundup as sold to farmers, growers and gardeners is a mixture of glyphosate and other chemicals, called adjuvants, that help the product stick to the leaves of plants thus allowing glyphosate to enter cells more easily and kill them. On its own, glyphosate is far less effective as a weed killer.

New Research

A team from CRIIGEN based in France compared the toxicity of various types of Roundup on sale with that of glyphosate alone, the breakdown product of glyphosate and one common adjuvant on three types of human cells (human umbilical, embryonic, and placental cells)¹.

The result was dramatic – the Roundup formulations caused “total cell death within 24 hours”, which was significantly more toxic than glyphosate, its breakdown product and one commonly used adjuvant on their own (see Figure 1 below). This effect was even observed at very low concentration: the researchers diluted Roundup by 100,000 times for the purposes of the experiments. This concentration is much lower than that used for the Roundup sprayed from tractors and corresponds to the residues that might be expected in RR soya after spraying.

Figure 1 showing the difference in toxicity to human umbilical, embryonic, and placental cells between Roundup and Glyphostae



Source: CRIIGEN presentation 2009

Residues in Food

Pesticide residues in foods are supposed to be below an internationally agreed Maximum Residue Level (MRL). When RR soya was introduced in the 1990s, the MRL for glyphosate in soya was raised from 0.1mg/kg to 20mg/kg (ie, raised 200 times) to accommodate the newly-developing trade in GM soya. No RR GM crops are approved for commercial cultivation in the EU, so at present this MRL only applies to imported crops.

Roundup is used in the UK to kill off cereals and oilseed rape crops just before they are due to be harvested to make sure the grain and seeds are thoroughly dried out. Residue monitoring results in 2006-08 revealed that 27% of cereals, flour and bread samples contained glyphosate residues, one as high as 3.8mg/kg. Samples of soya-based foods sold in the UK have been taken in small numbers. The results of this monitoring showed that Brazilian manufactured tofu/soya pieces contained glyphosate residues up to 1.1mg/kg. However, there was no indication whether this was produced using GM soya or not. There is no data available for the breakdown products of glyphosate or the common adjuvants.

There is no doubt that consumers can be exposed to low levels of glyphosate via residues in food. The position in animal feed, where the bulk of RR GM crops imported into the UK are used, is not clear because no residue monitoring data is available.

Farmers and Bystanders

The groups of people most at risk of being exposed to Roundup are the farmers who spray it and people who live in areas where the product is heavily used, such as the soya belts in Argentina, Paraguay and Brazil. The spraying of Roundup from aircraft is permitted in Argentina and Paraguay, increasing the risk of spray drifting from field onto neighbouring farms and housing areas. Research into the health of rural people in these areas is very limited at present.

Regulatory Weaknesses

The approval of GM crops and pesticides in the EU involved two regulatory systems. Neither process requires that the toxicity of Roundup as sold to farmers be tested. The GM crop approval system has a limited requirement for toxicity testing based on short term laboratory feeding studies of the GM crop.

Pesticide approvals require more toxicity tests using a wider range of laboratory animals for longer periods. Crucially, however, individual Roundup products are not tested in this way. Instead, glyphosate and the adjuvants mixed with it to make up Roundup are tested and approved separately, despite the fact that it is known that, "*Carrier solvents used in commercial formulations may change toxicological properties.*"ⁱⁱ Thus there is a serious gap in the regulatory system, which leaves people and animals exposed to a product which may be far more toxic and dangerous in its commercial form than stated by the manufacturer or regulators on labels.

Actions Required

The EU should carry out an immediate review of the safety of Roundup and other formulations of glyphosate. Licenses to use Roundup on food/feed crops should be suspended until data on the safety of all formulations to human and animal health has been established, including in the levels of residue likely to be found in food and animal feed.

UK Regulators should immediately lower the maximum residue level for glyphosate in imported RR GM soya beans to the previous level of 0.1mg/kg. This would greatly reduce the risk of further exposure while a full safety review of formulated glyphosate-based herbicides is undertaken.

Food manufacturers, retailers and feed manufactures should undertake monitoring of all raw ingredients on which Roundup and other glyphosate-based herbicides have been used, including animal products fed on GM RR soya or maize, to ensure they are free of residues before entering the food chain until their safety can be established.

Farmers and growers should ensure that they, their farm workers and bystanders are not exposed to Roundup by only applying it using full protective clothing and preventing drift off-field onto people, livestock or other crops. Buffer zones must be established along roads, watercourses and around property to minimise bystander and whole population exposure.

Local authorities and other major users of Roundup and other glyphosate-based herbicides should adopt similar procedures to protect workers and bystanders.

More Information

* The full briefing on this important issue is available at www.gmfreeze.org/uploads/D8C_seralini_long_doc_final.pdf.

For copies of the research carried out by CRIIGEN contact at CRIGEN@UNICAEN.FR

Notes

ⁱ Benachour N and Séralini G-E, 2009. Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells, *Chemical Research in Toxicology* Vol22 No1 pp 97-105 available from <http://pubs.acs.org/doi/pdf/10.1021/tx800218n>

ⁱⁱ WHO/FAO Datasheet on Pesticides No 91 Glyphosate July 1996.